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The Roman Fort of Saalburg.

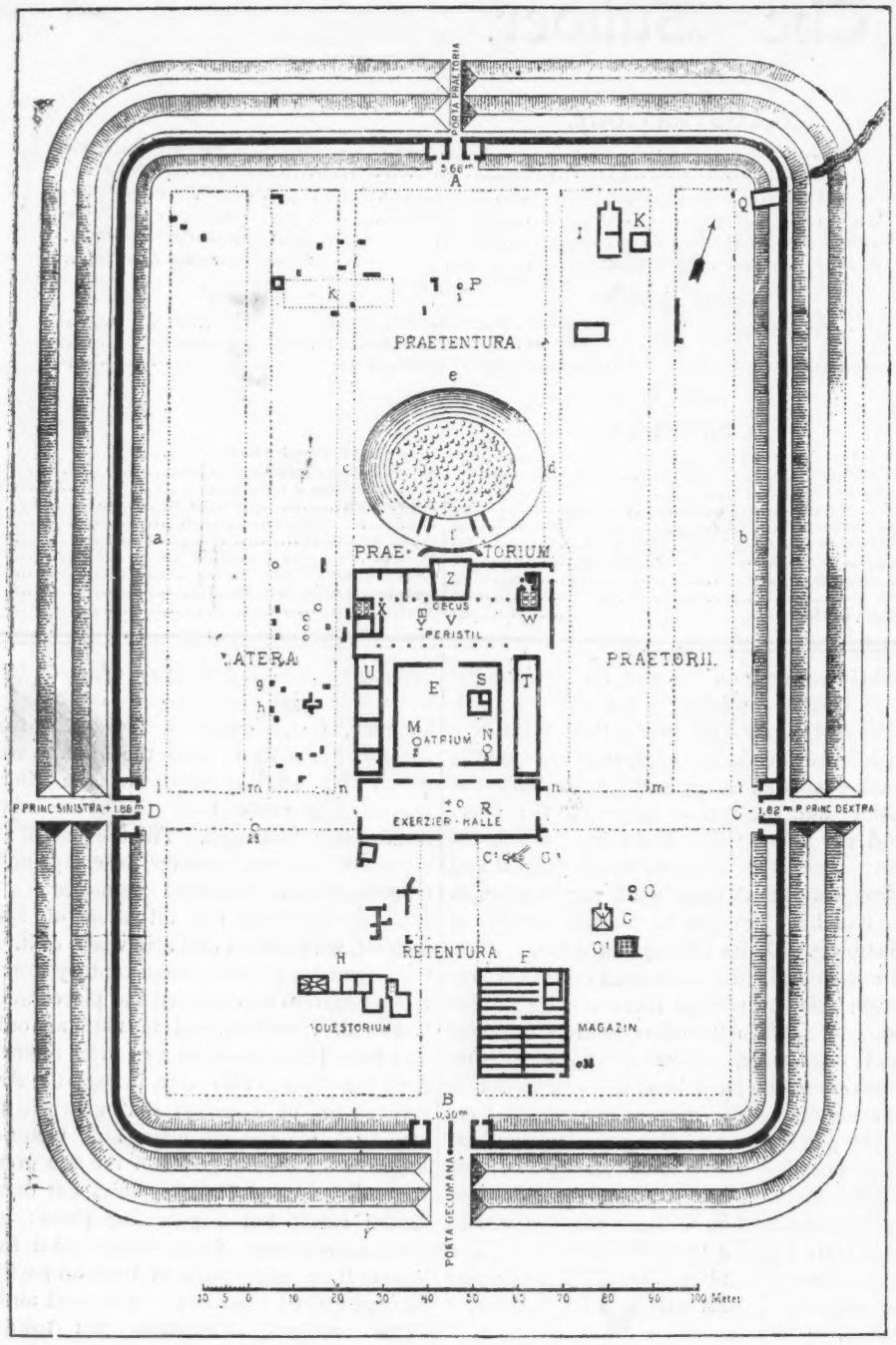
FROM any point in the fertile plain around Frankfort-on-the-Maine the range of the Taunus Hills is in fine weather always visible, forming a dark and well-defined wall to the valley of the Rhine and the Maine. As they are approached yet nearer, their outlines take a more defined shape, and the thick woods of pine and oak and beech with which they are covered are seen extending in level masses, now gloomy under passing clouds, now gleaming brightly when the sun breaks out. The pointed summit of the Altkönig, above the castled heights of Falkenstein, is, though not the highest of the range, the most conspicuous, but to east and west of it the hills pass out of sight, one varying but continuous mass. There are few Englishmen who have set foot on the Continent, who have not at one time noticed these hills; it is less well-known, however, that along this range runs in yet clearly-defined lines the boundary-wall, the Pfahlgraben, the *limes imperii* of the Romans, the wall of defence which stretched from the Rhine to the Danube, and was intended to protect the fertile valley of the Rhine against the tribes of Germany. Nowhere at the present day can one pass through the woods which so thickly clothe these hills without, on approaching their summit, crossing the plainly visible remnant of the defence—a low bank some two or three yards in breadth. Eighteen hundred years ago it was defended by a ditch and stakes; along it were placed at intervals watch-towers and forts: from the former the Roman soldiers could look northwards over wood and hill for the approach of the enemy. And even now if one ascends the wooden tower on the Fröhlichemann, as one height is called, it is easy to picture the scene, though centuries have passed away since the Roman occupation; for the eye yet wanders over thick woods rising smoothly towards the summits of the hills, and breaking abruptly into patches of cultivated land when the spurs touch on lower ground.

Between the Herzberg on the west, and the Gickelsberg on the east, there is visible a noticeable lowering in the chain of hills. This was the weakest spot in this natural line of defence, it was the easiest pass between the thickly-wooded valleys which extended to the Lahn and the fruitful fields by the Main and the Nidda; it was the spot which the Roman generals selected for the largest and strongest of their forts in this part of Europe. It has been known in modern times as Saalburg. Of its history in the times when the Romans held a precarious dominion over these hills and valleys there are no written records, but from the coins, soldiers' weapons and ornaments, votive altars, and other remains which have been discovered during the course of the excavations which have taken place here and along the Pfahlgraben, it is possibie dimly to follow its fortunes. This history, necessarily meagre and vague, is briefly stated in Colonel von Cohausen's and Herr Jacobi's excellent little work "Das Römercastell Saalburg," from which the plan accompanying this article is by permission taken.

It is known that Drusus in 11 B.C. built a fortified place (præsidium) on the Taunus Mountains, but no traces of his legion have been discovered in or near Saalburg, and it has been surmised that the fort was erected in the reign of Domitian towards the end of the first century after Christ. But as coins of predecessors of this Emperor have been found in and near Saalburg—few, no doubt, butstillsome—it is perhaps rash to endeavour to fix any particular time as that at which Saalburg began to be a fortified Roman station. At the best it is guesswork only, nor is the actual date of any particular importance. There is no doubt about the broad fact that for years it was an important fort, and that it remained in the hands of the Romans until the end of the second century after Christ, with some uncertain intervals during which it fell into the possession of the Germans. The latest Roman coins which have been found are those of Claudius Gothicus, whose short reign of two years lasted from A.D. 268 to A.D. 270. By the beginning of the third century moss and underwood were doubtless rapidly hiding this stronghold from view, and soon its site would be indistinguishable from the rest of the vast woodlands by which it was surrounded. It became a mere stone quarry from which peasants could fetch the materials for their cottages; while in later years the high road from Homburg to Usingen, which passes a few yards from the fort and cuts in two the Roman road which led straight down to the Rhine, was largely made from the stone which the Romans had used. Till the end of the eighteenth century, however, the camp and its neighbourhood remained unnoticed. In 1780 it attracted the attention of Elias Neuhof, who visited and also wrote of it. At the beginning of the present century Roman relics began to be collected and placed in the Castle of Homburg, and in 1818 an order was issued that no stone was to be removed from Saalburg. This was, in fact, the commencement of a period during which the attention of archæologists and historical students has been given to the site of the fort. From 1830 Homburg was not only a health resort but a gambling place: and great crowds were drawn thither, and from among them many persons from all parts of Europe visited Saalburg. The local authorities received substantial aid towards the exploration and excavation of the fort and its neighbourhood from the director of the Kursaal and gaming-tables: so that the main outlines of the fort were fully discovered. From that time the work has never been allowed to flag; sometimes it has been carried on by private subscriptions, sometimes by grants of public money. Thus in 1875 a sum of 10,200 marks was granted towards the excavations, and further subsidies have been allotted when necessary. The contrast between the steady and careful energy with which this work has been carried on for years, the judicious manner in which it has been supported by the funds of the nation, the useful and intelligent interest which has been taken in it at all times by the reigning house of Germany, and by a soldier so renowned as the late Field Marshal Moltke, and the absolute denial of all national support to the exploration of Roman remains in this country, is not only marked, but disgraceful to us as a people.

Not only indeed has the fort and its neighbourhood been gradually brought to light, but every relic is promptly sent to a special museum at Homburg, where it is properly placed or catalogued.

Of the fort an accurate idea can be obtained from the plan attached to this article, and already referred to. From the general plan of



The Roman Fort of Saalburg.—Plan.

C D	V Principalis.
G G^1 G^2	Buildings which could be warmed by hot air.
I K	Bath House.
M N	Wells.
P	Well.
Q	Latrines.
S	Sacellum—Here the Standards and Portrait of the Emperor were kept.
U T	Living and Store Rooms.
X W	Chambers which could be warmed.
Y	Sandstone Slabs—Possibly the base for a statue of Victory, some relics of a bronze statue having been found in the immediate vicinity.

the site given by the late Col. von Cohausen* it appears that, under the protection of the fort, and to the southward of it, were erected a so-called villa and smaller buildings. The "villa" has been supposed to be the Palace of Caracalla, who was much in the Rhine Valley from 211 to 217, but it was the chief of the civil buildings, many of which were probably of so temporary a kind as to have left no trace behind. But a fort which could hold as its normal number from 1,000 to 1,100 men was certain to cause a small town to grow under its shelter, just as in Mediæval times the citizen built his house under the protection of the Castle. The numerous wells which have been discovered to the south and east of the fort undoubtedly indicate the position of civil dwellings. These wells, as well as others within the bounds of the fort itself are all indicated on the general plan of the site given in the book; those which were lined with wood and were rectangular in shape being marked by a small square, whilst those which were circular in form and were lined with masonry are distinguished by a circular mark. They vary much in depth. The well at the north end of the fort, which was probably the chief water-supply of the garrison, is 26 mètres in depth, whilst some of the others are no more than 7 mètres; but, as we have said, those outside the fort are chiefly valuable as evidence of the site of non-military dwellings, which in their turn indicate the importance of the fort itself. In the museum at Homburg the lining, buckets, and apparatus of these wells can be seen, the oak of which they were made being as hard as iron.

Reaching the place by the high road from Homburg, one leaves it a short distance above the inn, and treads the old Roman road, which is now overshadowed by a picturesque avenue of limes. As we approach the principal entrance—the Porta Decumana—the defences outside the wall are plain; firstly an interior ditch immediately under the wall, then a rounded mound, and then an external ditch. It is only near this gate that this formation of the outer lines is perfect, for it has not been thought necessary elsewhere to clear the ditches from the deposit of centuries, or to restore the earth-wall to its original form. When we have passed inside the gate, the eye is at once attracted by the restored battlement* in the south corner, parallel with the Porta Decumana. But this piece of restoration, though it shows the character of the wall, cannot bring before us the fort as it was. Now, as we stand at this main entrance we see the entire fort 221 mètres in length, and 147 in breadth. It lies before us, a well-kept lawn studded with trees, and broken in places by low walls of various forms which rise little above the ground which near the walls of defence slopes up to them somewhat sharply. We see from one end to the other, and from side to side, but the low walks indicate the position of important buildings, and were we standing on this same spot when the place was a military stronghold they would intercept our view. In front but somewhat to the left was the Quæstorium, to the right a large building supposed to have been a magazine: in the centre of the fort the Prætorium would have broken our view, hiding from us the northern portion of the fort with its narrow gateway, the Porta Prætoria—leading to the Pfahlgraben and the sloping hill-side beyond — and we should hardly have seen as we now do the two side gates one third of the distance from the southern ends of the side walls; now mere openings, in former days archways with side towers. The only portion where this general view is now in any way broken is at the eastern side, which is yet in parts hidden by brushwood and earth; but the work of clearance is being so steadily continued that by the end of the summer of 1896, it may reasonably be expected that the whole circuit of the fort will be clearly open to view. The ground plan will then, so to speak, have been laid bare and plain; every foot of the walls will be apparent: within them are the bases of the buildings which we have already mentioned, showing plainly in some instances the elaborate system of heating practised by the Romans. In addition there are the amphitheatre, and the well-planned bath house from which the water ran to the covered latrines in the north-west corner. We thus see in every detail the formation of a Roman fort of the most elaborate kind; not one throughout the Empire was more important than that of Saalburg; and it is plain to us. But yet to-day the pleasant turf, the hardly perceptible walls, the rural quiet, the encircling woods are little like the crowded fort of Roman times, with its upstanding buildings, its numerous troops, the wide open space around the walls, and the *limes imperii* stretching away on either hand. But some little incident, perhaps the discovery of a coin as we pass by, flung away, it may be, by a Roman soldier as the fort was stormed by Germans, or dropped in a conversation with a comrade, may awaken the imagination and enable us to realise the place as a whole and as it was, full of life, in the warm summer days, in the snowy nights, in peace when the soldiers went in and out, and the traders were busy in the civil quarter without the walls, or in war time when, waiting for the approaching barbarians, the Roman soldiers lined the Pfahlgraben, and their shields and spears were seen on the battlements. Yet it is much to have the general plan before us; to be able, standing at any point, to comprehend the whole arrangement of the fort, and then each one may picture it, or people it as he likes, in peace or war, in sunshine or storm.

* Colonel von Cohausen died at Wiesbaden on Dec. 3, 1894, aged eighty-three. He was a skilled military officer, and a learned and patient archæologist. Among other military positions which he filled during his long life was that of Chief Engineer at Coblentz. At the time of his death he was a member of the Imperial Commission on the "*Limes Imperii*." Colonel von Cohausen published works on Cæsar's Bridges across the Rhine, the antiquities of the Rhine, and similar subjects, in addition to the more recent and important "Der Römische Grenzwall in Deutschland."

* Restored in 1885.

NOTES.

IN a pamphlet ("Delphika") dealing with certain questions of Delphic antiquities, Dr. Dümmler discusses among other matters the origin of the Lesche at Delphi, and of

leschai in general. It has usually been thought that these *leschai* were of comparatively late origin, and were merely convenient places of gathering for casual social purposes, sheltered from sun and rain—"conversation halls," as by a false etymology they were called. Dr. Dümmler, from an examination of classical passages, and specially a recently-discovered inscription, arrives at the original and very interesting conclusion that the *leschai* were originally tribal burial-places, hence places of meeting where the survivors took counsel, and hence in later days places for accidental social gathering. According to this view the lesche (λέσχα) was originally the large rectangular stone laid over the grave, also known as a table (τράπεζα); and on one of these in Rhodes is inscribed, "I am the lesche of . . . ." So long as the dead were buried in the house this would be close to the family hearth, where the family gatherings and the family worship would take place. Later it was removed to a distance, but always within the tribal boundary. The new view is most interesting in relation to the great Lesche of Delphi, which Polygnotas decorated with the descent of Odysseus to the lower world—a subject obviously well-fitted to a burial-place.

THE paper read by Mr. Myres at the Hellenic Society on Monday recorded the very useful investigations of himself and Mr. Paton in part of Caria, in tracing and endeavouring to identify the sites of various towns mentioned by Strabo, and thus marking out the lines for future more detailed exploration; but nothing much of architectural interest arose immediately out of it. An archaic Ionic capital was found at Alizettin; remains elsewhere of the walls of tombs, one of which appeared to be intended to be corbelled over in a horizontal arch as in the "Treasury of Atreus," and various other pieces of ancient walling, but nothing of very special interest. We must again recommend that some attention should be given at the Hellenic Society to providing adequate illustrations of papers read. As a rule, papers read at the Hellenic Society are the worst illustrated of any we ever hear. If a map or plan is hung on the wall, it is sure to be so small as to be invisible to the majority of the audience; and the handing of photographs round among the audience is a most exasperating and useless way of illustrating a paper. By the time one of these has been passed to about the sixth person, the lecturer has passed to something else, so that the listener can only study the illustration at the cost of losing the thread of the discourse. A paper bristling with an alternate use of the ancient and modern names of places cannot be followed in any intelligible manner on such a system. Those who read papers at the Hellenic Society ought to produce illustrations in a form in which they can be seen and followed while the paper is being read, and the Council ought to make a point of this.

IN the course of the report presented by the Board of Trade Inspector last week upon the railway disaster at Chelford, some practical suggestions are made as to the precautions necessary for averting similar catastrophes in the future. It is recognised that the suspension of shunting operations while passenger trains are passing, is next to impossible in practice, although it may be desirable in theory; but the inspector points out that the rules of the railway companies are open to amendment. However unforeseen and unusual the circumstances under which a railway accident occurs, the fact that the accident happened proves the possibility of a similar result at any time under similar conditions. The prime cause of the disaster in this case was the exceptionally high wind, and the associated railway companies are strongly recommended to lay down regulations in their rule-books to be observed during the prevalence of high winds. It is suggested that at such times all wagons should be kept attached to the engine when being set back on to their trains; or that, where this would lead to unreasonable delay, all wagons shunted back loose should have the brake pinned down as soon as they come to a stand, no matter what may be the gradient of the line at that particular place. It is also recommended that all wagons should be fitted with a brake handle on both sides, "instead of, as in the majority of cases at present, upon one side only." It seems astonishing that such a recommendation should be necessary; considering the way wagons are worked in shunting, it ought to have been obvious to railway managers long ago, that there ought to be a brake available on both sides for checking wagons on a gradient.

IT is to be hoped that those who are interested in the water-supply question for London have duly taken note of Mr. Bryce's reply to a question put in the House of Commons on Monday in regard to the provision of means for water supply to houses in the event of the mains being frozen up. It was stated in Mr. Bryce's reply that "the Companies under their Acts were expressly protected from liability in respect of a failure of direct supply by reason of frost." That, we venture to think, fairly caps the situation. It is not sufficient that the supply of a necessary of life and health to the largest city in the world should be in the hands of trading companies who find every excuse for cutting down their supply or charging extra for it for the benefit of their shareholders; but if the supply of water is stopped by natural causes, the loss is to fall not on those who undertook to supply the water, but on their customers, who have, of course, to pay their rates all the same! It would be difficult to imagine a more monstrous and iniquitous piece of legislation.

THERE is no doubt at all that much of the discomfort which people both in town and country suffer by the loss of the water-supply owing to the freezing of water-pipes, can be prevented by very simple precautions when the pipes are first put in. In some cases they may be placed in less-exposed places, in others they may be placed at a greater depth underground, in many instances they can be covered with felting or protected by various methods of a simple character. Even where there is no permanent protection, it is often possible to keep the water-supply intact by temporary means. Many persons must be familiar with a common country sight in winter time, namely, the farmer's pump snugly enveloped in bands of hay or straw. This is only an indication of what may be done by very simple means to prevent very great discomfort. There is no reason whatever why in towns the same principle might not be acted on by the use of coverings for outside pipes, which could be used in hard weather in winter, just as sun-blinds are used in hot weather in summer. At times, even the best precautions may not always be successful, but at present the English householder really takes no care to protect his water-supply. He generally bears the calamity very philosophically, but in many instances he might prevent it altogether, and so need not have to bear this household trouble on his shoulders.

THE practice of putting inscriptions on bells is not, as has been often thought, exclusively a modern one. Most museums contain specimens of ancient bells. Notably at Naples, a number are collected that were found at Pompeii and Herculaneum, but until quite lately there was no specimen extant of a bell with an inscription. At Tarracco, in Spain, when the workmen were quarrying stone for the works in the new harbour, they found among numerous other ancient remains a small bronze bell with the iron clapper still inside it. The inscription notes that it was used "in the sacred rites of Augustus," *i.e.*, for some imperial cultus; moreover—an important point—we learn from it a new Latin word for *bell*. Classical Latin knows only the word *tintinnabulum*, *campana* and *campanula* do not appear till the seventh and eighth century, and in Christian writers, these being obviously bells used to call the distant dwellers in *fields* to worship. In the inscription the bell is called *cacabulus*, from its shape like the cacabus, a cooking-pot. The inscription goes on to say that the bell was pulled by a nuntius junior, some kind of temple attendant. The word cacabulus survives in the Spanish *cascabel*. The inscribed bell has been bought for the museum at Tarragona.

THE collection of small paintings by Mr Alfred East, at the Society of Arts Rooms, illustrating effects of English landscape "from Dawn to Moonrise," is one of the most charming exhibitions which has been seen in the gallery for some time. There are one or two, such as "Grey and Gold, a Gloucestershire landscape" (21), which are rather tricks of effect, but the majority are solid painting, and many may be named (Nos. 9, 14, 16, 19, for instance) which are exceptionally successful as representations of effects of light and atmosphere very difficult to realise in painting, and are full of poetic feeling. Everyone interested in landscape art should look at the collection.

IT is amusing to note that on the occasion of the reading of a paper by an old member of the Architectural Association who happens to be also the editor of this journal, all the other architectural journals, which usually send representatives to the meetings of the Association, formally absented themselves. Whom are they supposed to punish by these tactics? Possibly their own readers, who may think they have a right to expect some report of a paper which was considered by the meeting as an important one; certainly not the reader of the paper, who, they may take it on the best authority, is entirely indifferent whether his name appears in their columns or not, and would not have even been aware of their defection had not his attention been drawn to it.

THE ADVANCEMENT OF ARCHITECTURE.*

BY PROFESSOR AITCHISON, A.R.A.

IN this lecture I shall speak of the emotions raised in me by the buildings I have seen, and then try to explain, if I can, why such emotions were raised. These emotions must to some extent be classed according to the conditions under which the buildings were seen. Those buildings that existed in my native town, London, when I first began to notice architecture, those that have been built since, and had therefore the element of freshness about them, besides their intrinsic merits, and those that I saw in foreign countries for the first time, and were both new and strange to me. In my younger days books were scarce, few libraries were open to the public, I may say none, for the few public libraries that existed were hedged round with difficulties for consulting them, and with annoying restrictions, while photographs did not exist. It is perhaps necessary to say that I was brought up in the Classical school of the Renaissance; that most of the elder architects whose opinion I heard, looked on Gothic in the same light as Vasari, it was to them "the tasteless style," though a few of them had tried their hand at it, and when the first Gothic design for the gold medal was exhibited at the Royal Academy, I heard several of the elder architects say that the Academy had sunk low indeed when it admitted Gothic designs in competition.

I think I first visited Paris in 1851; on reaching Havre I was much struck with the size and architectural pretensions of the houses there, as

* Being the fourth Royal Academy Lecture on Architecture this Session. Delivered on Thursday evening, February 7, 1895.

well as with their brightness, and on my way I saw Rouen, and then the sights of Paris. In January, 1853, I left for the grand tour, brimful of the eloquence of Mr. Ruskin. At Paris I was most struck by Mansart's Invalides, Perrault's façade of the Louvre, and Servandoni's St. Sulpice. I touched at Genoa, and admired the size and grandeur of the palaces, and was astonished at finding whole streets of them, some with hanging gardens. I next went to Leghorn, and thence to Pisa. I could not share Mr. Ruskin's admiration for the outside of Pisa Cathedral, but the inside seemed to me so original and striking that I made some water-colour sketches of it; thence I went to Cività Vecchia and Rome. As a boy I had taken a hatred to the Romans; want of judgment had prevented my seeing that success in nations is the great proof of their virtue and wisdom, and probably I had read bad or partisan histories. At any rate I hated them for their ingratitude towards their own great men, for their greed of power, their avarice, their want of generosity towards the vanquished, and their apparent monotonous success, and I crushed with pleasure the mouldering remains of the cruel giant city under my heel. I merely mention this to show that my mental condition was not favourable to the admiration of the ruins. The enormous height of the Colosseum, when one stood on the highest seat of that vast amphitheatre, impressed the mind more strongly than anything I have seen since, except looking down from the top of the Great Pyramid at Gizeh; but the reflection that the vast Flavian amphitheatre was raised to amuse the idle with the sight of men butchering one another, or of helpless wretches being torn to pieces by wild beasts, was not calculated to raise one's feelings of love or respect for the nation that had built it, and had perished. I then saw there that chief wonder of internal effect, the Pantheon; doubtless the size, fine proportions, and the artistic devices of the interior contribute something to the sublime effect, but the main cause is the single source of light being from above, and coming through the eye in the dome. About this I think there can be no doubt, as I have since seen a large modern church lit in the same way, which, though smaller and wholly without the architectural merits and lovely materials of the Pantheon, produced an analogous effect. On your first visit to Rome, you come from looking at a rather heavy, squat, circular building with a depressed dome, on to which a tolerably good portico has been clumsily attached, and on entering are thunderstruck by the novelty of effect, and the calm sublimity of the light coming in one mass from the top and casting deep blue shadows on the coffers of the vast dome. You have seen nothing like it before, and will see nothing like it again; unless you visit India. It is one of those first impressions that you never lose, and it is quite worth a journey to Rome to experience. I must tell you that I have never seen Syria, Persia, India, nor the far East. Fergusson in his Indian architecture and in his Parthenon, gives the Cave temple at Karli as the perfection of lighting; this is lit by a vast semi-circular window in the front. He says, "The effect is magical, and no mode of lighting which is to be seen anywhere equals it in scenic perfection." I should think, however, that no sunlight west of Greece would be strong enough to produce such an effect. Fergusson said of the Pantheon, "In simple grandeur it is as yet unequalled."

Now we are on the subject of lighting, I may as well say that something like the Karli cave lighting was adopted in one of the mosques at Cairo; the plan of the mosque is a cross, formed by a nave and transept, and is not lit like a cathedral by a lantern at the junction, but by the simple plan of leaving a courtyard there, and as the niche (Mihrab) should be on the meridian of Mecca, which at Cairo is nearly south-east, that part of the mosque is mainly lit by reflection: after the Pantheon, it is one of the most striking interiors I have seen. The architecture is almost Greek in its simplicity, and that part where service is performed consists of a plain chamber, vaulted in masonry, with a pointed vault; a deep band of inscription below the springing of the vault is its only ornament. The mosque was built between 1356-60, at the expense of the Mamluk Sultan Hassan: it is looked upon as the finest specimen of Moslem architecture in Cairo. The piece of the nave where service is performed is said to be 90 ft. long, 69 ft. wide, and 90 ft. high to the crown. I could not say after the lapse of time between the visits, which was the finer, the mosque of Sultan Hassan or that of Sta. Sophia. You all know that Sta. Sophia was built for a Christian church by the Emperor Justinian, a Bulgarian peasant, between 532-7 A.D., after the original basilicas had been burnt down. It was built from a model prepared by Anthemius of Tralles, with whom Isodore of Miletus was joined during its construction. By an artistic device, the main entrance to the mosque is through the low, dimly-lighted, narrow narthex, which acts on the eye as an olive does on the palate before tasting fine wine—the light and vastness of the mosque is brought out by the contrast. Nothing I have seen looks so vast; the dome seems to float over your head, as Milton said, "pendant by suttle magic." And the light, which is abundant, comes through the aisles and through the galleries, into the nave, as well as from many windows at a high level. The main shapes, too, are so fine, peculiar, and unusual, that they form another source of surprise and admiration, each end of the church being roofed by a half-dome, out of which smaller half-domes are recessed. The two at each end stand on arcades forming apses on the floor, and at the east end the third is the main apse. The walls up to the cornice are lined with slabs of lovely marbles. The shafts of the columns are mainly of porphyry and of verd antique; the capitals are carved in white marble, mostly of the pattern of some silver capitals Constantine had used, and the spandrels of the arcades are enriched with carving or *pietra dura*, while above the cornice are coloured mosaic patterns, angels and cherubim, on a gold ground; the Turks, however, have gilded over the angels, and turned the heads of the cherubim into stars. The gigantic texts from the Koran, on circular panels hung all over the mosque, destroy the scale of the building. Probably Sta. Sophia was much more effective when it was in the hands of the Orthodox Church, and its iconostasis had not been removed, for now the inside looks rather bare. The interior of St. Mark's, at Venice, is even more artistic and more gorgeous than Sta. Sophia. Owing to its nave being only about one-third of the width of Sta. Sophia, its comparative smallness excludes all idea of competition with Sta. Sophia, except in beauty and solemnity, nor is it so much oppressed with uniform lighting as Sta. Sophia, for there are dark recesses; nor with baldness, as besides the iconostasis, with its statues and columns, there is an isolated chapel and many altars, not to speak of the pulpit and ambo and the silver lamps. Like Sta. Sophia, it has been enriched with all the plunder of the East and West, from the columns of the Temple at Delphi to those of the Palace of Mausolus.

Nothing in the world that I have seen compares with the temples on the Acropolis of Athens for simplicity and perfection; the most recondite art has been used to make them seem artless, and to vary repeating members in that slight degree that, while seeming alike, they have those delicate differences that are seen in Nature's works, so that the eye never tires of looking at them, and is never satiated. As you gaze, there seems to come from them an emanation of sublimity, and though the whole looks absolutely free from mystery, you gaze till you find a deeper mystery about their superhuman perfection.

I go on with early Renaissance work because in it there was a similar ideal, though differently carried out. The Greeks sought ideal loveliness by perfect simplicity, the Italians by a delicately graduated ornateness that was the acme of perfection of its sort, and both were utterly opposed to the very genius of Gothic. Although the architecture of the Italian Renaissance was evolved from Roman work, its character was in many respects quite opposed to it. The Romans were masters of the civilised world, had an Imperial revenue, had a marked taste for massiveness and dignity, and were slaves to rule, having found it so useful in military affairs. The Italian Renaissance architects had, with few exceptions, been brought up as goldsmiths, in which delicacy was required, and before they became architects were painters or sculptors, and were, therefore, of refined taste. They had only the revenues of small trading communities to dispose of; but they were born artists: every fibre thrilled with emotion at all that was beautiful.

Renaissance work was, of course, wholly different from Greek; 1,800 years of change and of constructive progress must of necessity have altered the thoughts and conditions of men; but, besides this, there was the domination of a new religion and the interpolation of the wondrous era of Gothic, and these alone could not help modifying their thoughts as well as their methods. Still there is something of Greek sweetness in the work of Bramante and a few others of the Early Renaissance architects. The outside of Sta. Maria delle Grazie at Milan (see lithograph), as seen from the east end, is one of the most beautiful Renaissance compositions I have seen. Certain pieces of the outside, and the interior of Sta. Maria dei Miracoli at Venice, have almost the same merits. When I first saw the interior of Sta. Maria dei Miracoli, in 1854, it was as lovely in colour as its carved marble was beautiful in form, and all the church trappings and banners were still there, as well as the later additions to the church; which, if not quite in accordance with the structure, added to its picturesqueness. I saw it long before it had been cleaned out, the additions and trappings removed, the marble scraped, and the ceiling repainted with the finest colours. It is difficult to make those who have been brought up in a Gothic school comprehend the feelings of the Classic student towards Gothic, more particularly when the works are small churches or secular buildings; the art has a sort of haphazard look, as if there had been no thought of its effect as a whole, and an absence of symmetry and of any feeling for propriety or beauty.

In the grander ecclesiastical Gothic buildings there is mostly uniformity on either side of the centre, and a good deal of the existing oddness is due to parts not being finished, or to their being completed at a later date.

On my return from Italy in 1855, Notre Dame at Paris was the only cathedral I saw in France that I looked at with pleasure, but as I grew older I saw that there was no common measure between the Classic and Renaissance ideals and the Gothic. The one asked for a clear and definite idea, carried out with coherence; for proportion, symmetry, and solemn dignity, like the calm flow of a strong, clear, and smooth river in the sunlight. The other appealed to wild emotions, to mystery, to the vague idea of infinity; it was like the storm-tossed ocean; while the artist was absolutely indifferent to congruity, to propriety, to anything but raising the highest emotions. These Western architects—for there was always some feeling for calmness and repose in the Italian Gothic architect, if we exclude those of Milan—remind one of a great musician playing before an immense audience, whom he wants to raise to ecstasy or drown in despair, and throws to the wind all the ordinary rules of music and composition, if he can only accomplish either or both of these two ends; it is almost like the comparison between Timotheus and Sta. Cecilia in "Alexander's Feast":

> "He raised a mortal to the skies;
> She drew an angel down."

I think, however, that if any architecture could draw angels down, it would be the Athenian, for it seems superhuman in its simplicity, calmness, and sublimity. Gothic is very human; it is full of aspirations, full of what might be called sudden impulses and whims, full of changes of purpose, full of bungles, full of weird and comic conceits, and almost as mysterious as life itself.

M. Jusserand, in his "Literary Life of the English People," makes the following remarks on Gothic as compared with Classic architecture, when speaking of Langland's poem of "Piers Plowman":—"No poem has been more really lived; it was for its author his refuge, his home, his true church; he always returned there to pray, to recount his troubles, and to live. Hence the strange incoherence, and, at the same time, a heap of unexpected information. The spirit that animated Langland is the spirit of the Middle Ages, powerful, disconnected, limitless. A Classic architect makes a plan, lays down beautiful arrangements, conceives a definite and complete work; the poet of the Middle Ages, if he makes a plan, does not follow it; he transforms it as he goes on; he adds a porch to his building, a wing, a chapel; a cathedral in the Middle Ages was never finished."

I give you this as the impression produced on an acute, intelligent, and charming writer who is not an architect. It is quite true that large abbey churches and cathedrals were rarely finished, or at any rate at one epoch; pestilence, famine, insurrection, and foreign wars took away the means of completion by causing want of men or want of money, and ambitious bishops or abbots were always seeking means of increasing the number of worshippers and pilgrims to their churches, whose offerings enabled them to beautify or add to the church; but I very much doubt if there was much more impromptu work about Gothic than Classic, for supporting complicated vaulting hardly admits of it, though it is quite possible the architects may have wanted to give to their buildings an unpremeditated air, and of course the aims of the Gothic and the Classic architect were absolutely different, but I

believe there is as little of the unpremeditated in architecture as there is in acting. In acting the whole effect is first thought out and studied, then rehearsed until the action becomes automatic. We can at once see what confusion there would be on the stage, if the action and movement of many actors were left to their impromptu solution.

Some historians merely tell us that they do not know what the philosophy of history means. Lord Bacon was not of that opinion, for he tells us that we study history to make us wise.

Machiavelli did not think so, or he would not have given us his philosophy of it. Guizot did not in that wonderful chapter in his history of the Civilisation of Europe, and if there be no philosophy in it, you may look on it as a bad novel, as a catalogue of crimes, or, as Byron said, "The Devil's Scriptures."

As yet there is scarcely an attempt at the philosophy of the visual fine arts, and, as far as I know, absolutely none of architecture, and it is mostly written of as you would about making a pudding. You want a good recipe for a good pudding. Yet I never look at any bit of architecture, modern or ancient, without what I call the philosophy of it engaging my attention. In looking at Attic and at Gothic architecture one is compelled to ask oneself what produced the extreme perfection of the one and the wondrous flight of the other. The knowledge and skill required to raise one of the great cathedrals, even if it appealed as little to the emotions as a modern iron bridge, are marvellous, and we know that in man's work no great emotion is ever evoked unless the soul of humanity is greatly stirred. In fact, mankind is but a poor collection of uninteresting atoms, when it is not swayed by some mighty impulse of faith, devotion, patriotism, or benevolence. We are surprised, in reading of the times of persecution and martyrdom, at the crowds that put themselves forward to incur both. The fact is that mankind soon get sick of life which is bounded by that simple formula, "to gormandise . . . to sleep and snore and rend apparel out:" the divine particle wants to assert its supremacy over that part that we have in common with the brutes.

The great personalities of the world have mostly been actuated by one of two motives, the hope of fame or of paradise, to enable them to undergo the requisite labour, and support the trials. Napoleon said his aim was fame, and one of the gravest charges Gregory Nazianzen brings against the Emperor Julian is this, that he defrauded those Christians of the certainty of paradise, who smashed the statues of the heathen deities; for instead of having them martyred by torture, he simply had them whipped, as Gregory says, not only by this malice preventing them getting a crown of glory, but also rendering them ridiculous.

We hear people talking of reviving Gothic. Industrious men who have the intelligence and capacity to learn what is to be learnt of it, would have the requisite knowledge and skill to reproduce an imitation of what the Gothic men did; but to reproduce the real Gothic that was produced in the thirteenth, fourteenth, and fifteenth centuries, you must not only have the same knowledge and the same skill, but the same surroundings, the same beliefs, the same desires, and the same enthusiasm, which is impossible. Consider the effect on man of one single circumstance that alone renders it impossible. Since the fifteenth century man has learnt that this world is not the centre of our universe, not even the centre of our system, but a mere speck among "yonder hundred million spheres." Modern Gothic is generally as much like the real thing as the Book of Mormon is like the Bible; but even supposing the forgery were so excellent that it would deceive an architect from the Elysian Fields, what then? You might compliment the modern architect on being an excellent and ingenious forger, but would his work give one scrap of our present knowledge, skill, taste, or aspirations, while if he builds a dead wall with holes in it he may show his own skill and taste, as well as the taste of a large proportion of the people.

M. Zola is one of the few great novelists who allows himself to notice that there is such an art as architecture in the world. In speaking of Ste. Eustache and the Central Market of Paris, he says: "This is a curious meeting . . . . this end of a church framed in this avenue of cast-iron. . . . This will kill that; the iron will kill the stone; and the time is nigh. . . . Do you not see, there is there quite a manifesto; it is modern art, realism, naturalism, whatever you like to call it, that has grown big in the face of the ancient art. . . . This church is of bastard architecture, besides; the Middle Ages was dying there and there the Renaissance was lisping . . . Have you noticed what churches they build for us now? They are like anything you please, like libraries, like observatories, like pigeon-houses, like barracks; but certainly no one believes that the Almighty dwells within. The masons of the Almighty are dead, it would be wise to build these ugly carcasses of stone no more, when we have no one to lodge in them. . . . Since the beginning of the century one single original monument has been built, a monument which has been copied from nothing, which has sprung up naturally in the soil of the epoch; and that is the Central Market. . . . A swaggering work, and which is only a timid revelation of the twentieth century."

I will ask you a few questions. Is there any emotional subject now that would want a building to rival one of the great English or French cathedrals to express it? If so, would the nation subscribe the funds? Supposing you answer this in the affirmative, then I ask you, have you the skill to build it? And would the subject require you to raise towers and spires hundreds of feet high to properly express it, after you had lavished all your art on proportioning and enriching its exterior?

If no such ideal exists, and animates the people, how could you get Gothic again? An imitation Gothic building would resemble the real thing as much as the cast skin of a snake resembles the living creature! I am surprised, however, that nothing has been written to give us the least idea of the state of the people in those days. Long centuries of study, effort, trial, and failure, had produced the knowledge and skill in the architects necessary to erect such stupendous buildings. You may feel sure that the people had new aspirations of momentous import, and expected that these aspirations were on the point of realisation, to produce such astounding results.

I believe it was the overthrow of feudalism, and the evil power of the clergy, that was looming in the distance, as well as a prophetic vision of science and liberty, that so moved them. Depend on it, that the old proverb is true, that "Coming events cast their shadows before." Doubtless much more happiness was expected than has been realised. "Man never is, but always to be blest."

To find out the secret of how their emotional effects were obtained, we must adopt the same methods with the great Gothic cathedrals as we did with the Renaissance buildings and see what is due to proportion, what to shadow, what to sculpture, and what to fringes. There are three French cathedrals with the same motive, Notre Dame de Paris, Amiens, and Reims; each has three porches, a centre with a rose-window, towers on either side and a range of the effigies of kings. Notre Dame is the simplest and most masculine, and the architect has treated the arcade of kings better for sculpture as being nearer the eye, and as a composition uniquely; observe how perfectly the figures are framed for effect, and how the flat, cusped head of the arcade checks the eye from wandering, while the band of arcade and figures, binds the whole façade together; it was a stroke of genius. Looking critically at the front, the main story is too squat, and the open arcade above too high. Amiens has the best porches, their deep shadow is very striking when the sun is not on the face, though the fringe round the arches is trivial and spoils the solemn effect; the proportions of the front are not happy, and the whole is overdone with ornament that blurs the outline. Reims has the finest proportioned front; the arcade of kings is made important by putting the statues on pedestals; the canopies on the gable of the central porch looking like a flock of doves, is a quaint and rather a pretty conceit: on the other hand, the poking the rose window into a pointed arch is a bungle. Before you will get a building to vie with any of these, you must have a popular ideal to be embodied, passionately longed for, a style and a mastery of it, which I hope the profession is striving to get.

The proportions and the outlines of the Gothic cathedrals, not to speak of their vast size, greatly contribute to the impression they make on us, but just as the Athenian architects hid their art to charm a cultivated and fastidious people, so did the Gothic architects arrest the attention of uncultivated crowds by the means they employed. Screens, like lace, seemingly too slight to support themselves, and window traceries that accomplished everything that stone-work should not try to accomplish were sure to attract attention.

In the fronts of cathedrals there is an endless variation of plane, broken up by figures, niches and pinnacles; arches, too, were enriched with figures, twisted into every possible shape, and put in impossible places, such as those canopied figures hanging down from the arches of doorways, apparently in defiance of the laws of gravity, while above and beyond the façades, towers, spires, pinnacles, and buttresses, are grouped. To find out what was essential to the main effect could only be ascertained by exhaustion. Most of you probably know how the method of fixing the impressions on daguerrotypes was found out. The chemists had tried everything their science suggested to fix these impressions without success. A silvered plate with its unfixed impression, was put away in a cupboard where glass-vessels and open chemicals were temporarily stored. After some time the plate was taken out for more experiments, and the picture was found to be fixed. Surmises were made as to what had fixed it, and experiments were tried on other plates, but without success; so fresh unfixed impressions were put in, and each article was taken out one by one, the last thing removed being a basin full of quicksilver, and it was then found that the impressions were fixed by mercurial vapour.

I have in a former course of lectures given some account of the various effects produced by the arrangement of the lines and by the light and shade at the Parthenon; it is of little use going over it again, as though the Parthenon is admirable for its purpose in such a climate as Greece, and the most sublime building in the world in Greek atmosphere and sunshine, it is of little use to us in our climate, as well as being absolutely ineffective in our atmosphere for more than half the year; I may add that the long straight-topped façade of Lincoln forms much the same contrast with the towers, as the steps do with the Doric columns of a Greek temple, only in the former the parts contrasted are colossal.

The apse of Bramante's Sta. Maria delle Grazie at Milan is one of the most perfect examples of charming effect that is to be found in Italy. Very little would be lost in its general effect if the greater part of the subsidiary forms and enrichments were left out, for the main effects are due to the happy proportions of the horizontal divisions, and to the composition of shapes due to the plan; that is to the polygonal arcade over the dome, to the contrast between the square parts and the round apses, and to the shadows cast by the overhanging roofs: though something no doubt depends on the circular panels in the surbase, the round shields in the first floor stylobate, and the round windows above, which so admirably contrast with the vertical and horizontal lines, and give the necessary suavity to the whole composition. With the exception of the arcade of the crowning polygon, there is very little shade from openings, most of the windows being small circular ones, and glazed near the outer surface. I think there are only two rectangular window openings in the apses above the surbase, and one above, which show in the same view; but, although the composition is both elegant and lovely, it hardly impressed me with the solemnity proper for a large church; it looks more like a palace, where all the arts of war and peace were being studied, and the amenities of high life being practised. It might have been the palace where the attainments proper to a courtier were being descanted on by Count Baldassare Castiglione. The inside is from the hands of some bungler.

There is a most beautiful composition on the moat at Nuremberg; it is merely a sort of open loggia, seemingly used as a tannery, on the top of a house; the simple but delicate shapes, with a due proportion of light, shade, and shadow, make it one of the few things that any first-rate architect might be proud to have done. Bramante's façade of the Sta. Maria del Popolo at Rome is also very sweet, very simple, and very effective; it owes some of its charm to the graceful lines that cut off the segmental pediment to admit the central feature.

Among the buildings whose admirable effect depends on the contrast of shapes, and on shade and shadow, is the Fountain of Ismael Pasha at Cairo. The lower part is semicircular on plan, and is built of stone, with large segmental-headed windows filled with bronze open gratings of quatrefoil pattern, with what I took to be a wooden polygonal building on the first floor. It was, when I saw it, in a very dilapidated condition; the widely-projecting roofs, with double rows of pierced eaves-boards, cast deep shadows, with fringed edges, and there was a great contrast between the simplicity of the massive stonework of the ground story, and the slightness and great variety of the smaller forms and openings above, but it could only be effective in a sunny climate. We must never forget that for about three-quarters of the year we have, for the most

part, a dreary, sunless, misty climate, and must try and make our buildings effective in that climate; while in our manufacturing towns we have dust, soot, and a corroding atmosphere, so that all fine work is soon filled up with dust and soot, and plain surfaces are eaten into. In London, almost the whole merit of Corinthian capitals is lost, for whiteness here in London means bad stone that rapidly decays.

We must content ourselves with the reflection that the climate produces a vigorous race, who have managed to live and thrive in every climate in the world; besides, it is the difficulty of succeeding that stimulates effort, gives pliability to the mind, and will also help to give a national character to our architecture, just as an able planner shows his skill with a very irregular piece of ground.

George Mason had been studying sunlight in Italy for fourteen years, and when he settled again in his native county, North Staffordshire, he was in despair, as the sun rarely shines there; but when the President pointed out to him that there were beautiful episodes to be painted in that grey atmosphere and weird scenery, he took heart, and painted the most poetic subjects that England possesses. Our Gothic architects did not sit down and weep, and say architecture was impossible because they had not the sunshine of Asia Minor, Syria, the Hauran, or Cairo, but did what the Greeks did—they tried to make mouldings and forms that would tell in their own climate; they had not the taste and refinement of the Greeks, but they made their mouldings tell. If they wanted a streak of light on a cylindrical surface, they put a fillet or a nose on it, and they made the outlines of mouldings tell by undercutting. It may be urged that we should use Gothic, but that does not represent our knowledge, skill, or taste. The Romans were appalled by Pyrrhus' elephants, could not resist them, and were trampled down by them in the first battle; but they did not give it up as hopeless; they said, cannot we frighten these great beasts and make them trample down their own people, and tried the fire-balls that succeeded.

I only recollect one building in London that gains by the dreary climate and the soot—Newgate. When we see that roughened, black, massive corner in Newgate-street, we always think of Dante's lines, "All hope abandon ye who enter here."

The streets of London call loudly for some brightness and colour—we even hail with delight the blue and white tiles of the oleo-margarine shop.

Directly you go out of genuine architecture—Greek, Byzantine, Gothic, or Saracenic—you have this ugly fact before you, that the beauties are obtained by the skilful and artistic handling of what in itself is a pretence, for, as a rule, Renaissance buildings pretend to be open colonnades walled up.

Cornices are, in my opinion, not only reasonable, but proper for every building that has not dripping eaves, for they take the rain-water outside the walls, so that overflows do not damage the building, and strings are reasonable things as ornamental coverings of the external sets-off of walls; but engaged columns or pilasters are nothing but the pretence of posts or pillars carrying a bressummer, walled between. If we can shut our eyes to this ridiculous pretence which has done so much to prevent any rational development of architecture, we must admit that the application of all the most brilliant architectural talent of Europe to this form has nearly brought it to decorative perfection. I think few persons of taste will deny that there is an excellence of proportion, a beauty of execution, a certain stateliness, and a style, about the best examples, that surpass anything since the palmy days of Greece. Take the Town Hall of Brescia, for example (see lithograph), said to have been built in 1508 by Formentone; suppose that a building were required to produce a definite idea of stately magnificence, could any building convey it better? The building is of large dimensions, two stories high, the top piece above the crowning balustrade being comparatively modern; the ground floor has but three arches; in the spandrels are hemispherical recesses containing busts, life-size at least; in the middle of each pier is an a tached Corinthian column, round which the entablature breaks, and at each end is an additional pilaster to take the balustrade, that leaves a walk between it and the walls of the first floor. The frieze of the ground floor is ornamented with lions' and men's heads. The first floor has three immense windows, whose dressings are Corinthian pilasters with an entablature. The friezes of these are carved with foliage and figures in high relief, and they are capped by a modillion cornice; four pilasters, with carved shafts, form panels for the windows, and between each window and the pilaster is a large boss about the middle of the story. The whole is crowned with an entablature about one-seventh of the whole height of the building; this has a richly-carved frieze in high relief; above is a gigantic balustrade with four figures standing in front of it, which we think can hardly have belonged to the first design, and on the balustrade are four larger figures, and there are obelisks at each end. The height of the building is about five-sixths of its width on the ground floor.

No architect with any feeling for stately proportion has seen this for the first time, without thinking it is one of the finest halls he ever saw. The effect is produced by a mixture of sculpture and architecture, but, architecturally speaking, the sculpture is merely a method of accentuating the upper pilasters and the friezes, and giving variety to the sky-line. The regular repetition of the lions' heads on the lower frieze give scale to the building, and as a feature could not be left out, nor could the hemispherical hollows in the spandrels, for these repeat the deep shadow of the lower arcade. I do not know if the palace has been measured, but if it has been, a most valuable lesson might be learnt by drawing out the front, without the sculpture, by substituting plainer orders, or leaving them out, to see what is absolutely necessary to obtain an equally impressive effect. It is only when this has been done that you could see what is due to the proportions, including the projections, and what to the sculpture. It is only by such means that a student can get the requisite knowledge, for executing a building to rival it in effect.

For mere beauty of line and composition few things are equal to the front of Bramante's Cancellaria, but being of such great length its parts are hardly bold enough in projection to make it effective.

For grandeur and calm dignity, there is perhaps nothing superior to the Farnese Palace, in spite of its improprieties, its inconsistencies, and, to say the least, the commonplaceness of its ratio of height to length. It has the merit of not being disfigured by attached columns or pilasters, and has the advantage of great size, an advantage that should never be overlooked; and though San Gallo (Antonio Piccone), Michelangelo, and Vignola are said to have had a hand in it, they have managed to keep the appearance of size, and each of them has understood the value of monotony and repetition in producing an effect of grandeur. It is dull, I might say excruciatingly dull, but I fear that that is the price one has to pay for grandeur. For such a building, whose propriety and convenience have obviously been sacrificed to external effects, the angle-windows are too near the corners. I think the first-floor windows would have been better had the pediments been alike, and the Venetian window in the middle is only saved from being a gross bungle by the three grand shields over it. The rusticated cart entrance is out of keeping with the rest, but in my eyes the greatest fault is the great height between the tops of the upper windows and the top of the cornice—it suggests garret windows behind; for enormous vaults can hardly have been needed for the retainers' bed-rooms.

There is stateliness and dignity in the Vendramini Palace, and inventiveness and art in the Spinelli and the Manzoni Palaces, but there is too great a want of repose in both the latter for great stateliness or dignity. The Hall of the Confraternity of St. Mark (La Scuola di San Marco) is one of the most fascinatingly-beautiful buildings in Italy, and what may be called its porch is the perfection of adorned beauty, but its perspective architectural panels are, I think, a mistake. Still we should never forget that "a thing of beauty is a joy for ever."

THE ARCHITECTURAL ASSOCIATION:

LONDON BRIDGES, ARCHITECTURALLY CONSIDERED.

THE ordinary meeting of the Architectural Association was held on the 15th inst. in the Meeting-room of the Royal Institute of British Architects, 9, Conduit-street, Mr. E. W. Mountford (President) in the chair.

Mr. B. F. Fletcher (junior hon. sec.) proposed a vote of thanks to Sir A. Blomfield for allowing the members to go over the new Church House at Westminster, and for the remarks thereon supplied by him. This was unanimously agreed to.

Mr. H. H. Statham then read the following paper on "The Bridges of London," which was illustrated by lantern pictures:—

In taking for my title "The Bridges of London, Architecturally Considered," I am aware that in the two last words I may seem to be begging a rather large question, in assuming that there is an architectural quality in a bridge which can be considered apart from its utilitarian side. Some of us probably think, and I should be inclined to agree with them, that it is a great pity the professions of engineer and architect were ever separated at all; that every architect should be an engineer and every engineer an architect; and that the result of the separation has been that we have one set of men who devote themselves entirely to constructional problems, and ignore—are almost trained to ignore—the artistic and expressive aspect of construction, and another set who devote themselves mainly to the artistic side of construction, and sometimes know much less of its scientific side than they ought to know. In regard to bridge building, however, there is a rather distinct line of demarcation in the work, and that is the line of the water-level. It must not be forgotten, in considering the subject, that in building a bridge over water of any depth, and more especially water which is actuated either by strong currents or strong tides, the most difficult, and in a sense the most important part of the whole work, is that which is under water; and it is impossible that this could be successfully dealt with by any one who has not had special experience and special training in that kind of constructive problem. When we come above the water-line the problem becomes one of ordinary construction, which is, or ought to be, as much within the province of the architect as the engineer, unless in such exceptional cases as that of the great lifting leaves at the Tower Bridge, which again form an exceptional problem demanding a kind of mechanical knowledge which is not properly within the domain of the architect.

We, as architects, may therefore rightly leave to the engineer the problem of bridge foundations under water, admitting our inability to deal with it adequately; we only claim to have something to say in the matter when the work gets above water. And this, not only because the constructional work there is not (or, shall we more prudently say? ought not to be) beyond our capacity to deal with, but because the question of the design and expressive treatment of the superstructure, which comes into our special province, is of far more importance than it has been generally allowed to be. The fact is, there is hardly any kind of structure which may have greater influence, for good or bad, on the architectural effect of a city, than its bridges, in those cases where a large river flows through it. The bridges in such a case are among the most prominent objects in making or marring the general effect and impression of the place. They are seen both from the banks and from the river, they are seen on both sides (unlike many town structures), they are seen from above and from below, from close at hand or from a distance. In the most crowded city there is a clear vista along the river and its banks. You see the bridges in succession, a perspective of beauty or a perspective of ugliness. And what class of structure can be more capable of beauty than a bridge? Its series of arches contrasting with the long lines of its cornice and balustrade, and with the masses of the piers; the cut-water bases of the piers, which every bridge built in running water must have, and which give such a special character of the picturesque founded on the practical; and above all its situation above the surface of water, with all its magical effect of movement, of glittering lights (even Thames water looks beautiful in the sunlight), or of calm reflections; can there be any greater possibility for the production of architectural charm than in such an erection in such a situation? The very simplest stone arched bridge is an object of beauty, if you trust only to its natural disposition of lines and masses, and it takes a good deal of bad detail to thoroughly spoil it, unless the detail is very large and prominent indeed. Unhappily there seems to be now an increasing desire to build what are called "handsome" bridges, in which there is a great deal of detail, often very large, and generally very bad; and I hope to show that some of the older bridges of London, now removed, which were much simpler in design than their successors, were also far superior in architectural quality.

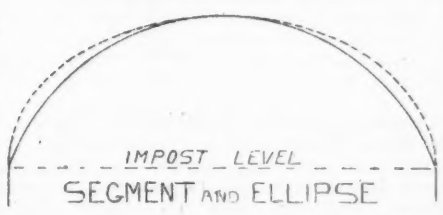
Let us first, however, briefly consider the architectural treatment of bridges in a more general sense. In regard to architectural expression there are four principal points to be considered: (1) The shape and proportion of the arches; (2) the treatment of the soffit of the arch; (3) the treatment and design of the piers;

and (4) that of the finish of the bridge along the top, *i.e.*, the cornice (if any) and the balustrade, or fence-wall. This latter is entirely independent of the construction of the bridge, but its design may have an important effect on the general appearance of the structure.

For anything worth calling a monumental bridge, in an architectural sense, there is but one material, stone, which can be regarded with entire satisfaction from our point of view. There are cases, chiefly those of railway bridges, in which stone cannot be used, at all events for the portions between the piers; we shall have to touch on that point presently; but for ordinary traffic there is hardly any case, except that of a draw-bridge, in which stone arches cannot be used as well and as satisfactorily as iron cantilevers or girders, as some of the existing examples among London bridges completely prove, and with infinitely better effect. As soon as you introduce iron, however well-designed, and however massive your stone piers may be, you at once destroy the monumental effect of the structure as well as its unity of expression; you force into architectural union two materials which are radically distinct in character and in properties; you introduce an element of decay, for however long iron may last, the most enthusiastic believers in that material can hardly pretend to believe that it will last as long as a built structure of granite, or even of a good building-stone; still worse, you introduce, as a necessity, the element of paint, a disagreeable artificially-made surface, which can never harmonise with nature as pure stone-work will. For the finest effect attainable from a bridge it must be entirely of stone, balustrade and all; even an "ornamental' iron balustrade interferes with and spoils the breadth and unity of the composition.

The number and relative proportion of the arches is a matter which is to some extent governed by practical considerations. Almost invariably it will be found that the older bridges have a larger number of arches, of smaller span, than the modern ones; in all the cases of London bridges which have been rebuilt, with the single exception of the Hammersmith Suspension, the modern ones have fewer and larger openings than those which they replace. This is in the main for the purely utilitarian reason, in the case of a river crowded with traffic, of offering the least possible obstruction to the water-way; with the additional economical reason, when bridge piers are so carefully and scientifically founded as they are now, that the cost is to a great extent proportionate to the number of foundations to be provided. In all probability the older bridges would for this reason have been built with fewer arches, even when the question of waterway was not so important, but for the fact that the older builders were not bold enough to venture on arching over a very large space. Nevertheless, it can hardly be questioned that the older type of stone bridge, with numerous and comparatively narrow arches, was in general a more picturesque object than the modern bridge with its wide spans and comparatively flat curves. Landscape painters who introduce a bridge as an incident in the scene will be found, I think, always to prefer a bridge of many arches to one of the modern type. But in the case of a river running through or past a great city, and which forms the water highway for its traffic, the reduction in the number of piers becomes a continually increasing necessity, which in the case of our last new bridge, placed at the point where the river traffic is thickest, has resulted in the employment of an entirely new mechanical arrangement for avoiding interference with the passage of shipping. Wherever water traffic has increased, however, there is always this continual fight going on between the architectural claims of the bridge and the practical claims of the water traffic. Some of the Thames bridges above the London district, such as Wallingford, Sonning, and Chertsey, are very picturesque, and Kew is as charming a specimen of bridge architecture as could be seen; and as far as the two former are concerned there seems no reason why they should not remain as they are, since the traffic is not extensive except in the way of pleasure rowing-boats. But Chertsey Bridge, where there is more going on, and where the arches are unusually narrow, has been found to be a practical inconvenience, and being, as American visitors say of our cathedrals, "somewhat out of repair," it will probably be removed before long, and will, undoubtedly, be replaced by one with wider spans—let us hope not an iron one. Kew I call a beautiful bridge, of finer design and much better built than Chertsey, and with fairly wide arches, and if it were an upper Thames bridge it might be adequate to its position for a long time to come. But it crosses the tidal portion of the river, where at spring tides the rush of water is tremendous, and it is at such times both an obstruction to the flow of water and a danger to the navigation: in the side arches the water during a strong tide is so throttled that the surface is forced up into a convex curve between the piers, and I have heard of cases of rowing-boats having to give up the attempt to pull through the arch against the tide. For these reasons we may probably consider that Kew Bridge is doomed before long, and it is to be feared that there is little probability of its being replaced by any structure at all equal to it in architectural effect. But the very fact of this necessity for the removal of some of our most picturesque existing bridges is an additional reason for calling attention to the subject of the architectural aspect of bridges, in the hope that we may persuade those who are concerned in rebuilding them to give some consideration to their architectural as well as their engineering treatment.

The form of arch to be adopted must be to some extent ruled by the proportionate width of opening in regard to the height of the roadway above the water-line. In the old-fashioned bridges, with narrow openings, the semicircular or the pointed arch could be used, and there was little to choose between them except as a matter of consistency of style. Mediæval bridge-builders, however, were rather given to use a segmental pointed arch, with heavy longitudinal ribs or groins abutting against the piers, as in old London Bridge, and in the interesting old bridge at Huntingdon, still remaining; but though this has a fine, solid, and picturesque effect, it is bad practically, as it lowers the headway unnecessarily near the piers. For rather wider proportioned spans the Tudor four-centred arch would be a serviceable form, if a pointed arch were desired as a matter of style, as it gives a flatter proportion, while at the same time rising quickly from the pier. When, however, we come to spans of 120 to 150 ft., as in Waterloo and London Bridges, none of these forms are applicable, and we have only the choice between an ellipse or a segment of a large circle, of which the first is illustrated in London Bridge, the second in Waterloo and new Putney Bridge. Of the two, I think, on the whole, the ellipse is preferable. It is a complete curve instead of an incomplete one; it rises tangentially from the vertical face of the pier, which is more pleasing to the eye than the abrupt angle made by the segmental arch; and where the springing is not much above the water-line, it has a practical advantage in giving more vertical space near the piers. For an arch of the same width and height, it, of course, means a rather flatter curve in the upper portion of the arch than would result from the use of the segmental arch, but the practical difference in this respect is not



after all very great. The segmental arch is no doubt simpler to construct, and where a pretty good height can be obtained in proportion to the width, as in Waterloo Bridge (which is 37 ft. rise to 120 ft. span), there is something grand in the simple sweep of the segmental arch; but where the proportionate rise is less, as in Putney Bridge (which is 144 ft. span to 18 ft. 6 in. rise), the arches have an appearance of being jammed between the piers instead of "springing" from them, which is not agreeable to the eye.

The question of symmetrical spacing of the arches is one which has been often debated. Where there are any peculiar circumstances which afford a suggestion for a different treatment of different sections of a bridge, I think these should be taken into account and frankly expressed in the design. There is an interesting example of this in the old stone bridge over the Dee at Chester, where the river is broken by shallows or rocks into several channels, and the bridge arches have been built of varying widths, just as the foundations of the piers could most economically be made; the effect is picturesque and characteristic. This is an exceptional case, however, and there can I think be no sort of excuse for irregular spacing of the arches of a bridge unless there is this kind of obvious reason for it in the nature of the site. But take the case, which may not infrequently happen, of a bridge over a river of which one side of the visible water area is shallow and unfit for navigation, and the navigation is necessarily confined to the deeper half of the stream; there would then be a legitimate leading to a picturesque treatment, building the bridge in a succession of narrow arches over the shallow portion (where the foundations of the piers would, if the ground were good, be a comparatively easy matter), and throwing one or two wide arches over the navigable portion. Thus there would be a highly picturesque effect of contrast produced, which would actually be a visible index to or proclamation of the physical conditions of the waterway. There are portions of the Thames where this reasoning in bridge-building would fully apply; but not within the London district. There we have no excuse, as far as the waterway is concerned, to depart from symmetry in design; and to my mind bridges which form portions of the architectural scenery of a great city should be treated symmetrically, when there is not any obvious practical reason to the contrary. But there is still the question whether we should preserve the same span in all the arches, or treat them with a symmetrical variation. Of our three finest bridges—London, Waterloo, and Putney—the first and last are designed on the principle of keeping the central arch widest and diminishing the others in an equal ratio each way. In London Bridge the centre arch is 152·6 ft. span; the two next 140 ft.; the end arches 130 ft. In Putney Bridge the centre span is 144 ft.; the two adjacent arches 129 ft., and the two end arches 112 ft. Waterloo Bridge, on the contrary, marches straight across the river with its regular stride of 120 ft. to an arch. Which method should be employed depends partly on whether you are anxious to keep your bridge roadway perfectly level from end to end, in which case, of course, the unvaried width of arch renders it easier to do this; but in every other respect the merit seems entirely on the side of the symmetrical variation principle, with the widest arch in the centre. A slight rise towards the centre of a bridge does not seriously inconvenience the roadway traffic—indeed there is a story of a country carrier who, on first crossing a modern-built bridge with a level roadway, grumbled that "he did not call that a bridge, for you could not tell when you came on it and when you were off it"; the slight curve of the balustrade and cornice line is more pleasing from a distance than a rigidly straight line; the variation in width of arch gives an increased interest to the design without destroying bi-lateral symmetry; while the greater width of the central arch is an actual convenience to the water-way traffic, especially on a river where a great deal of the barge traffic depends mainly on the tide for locomotion, and naturally keeps in the centre of the river where the tide runs strongest. The wide central arch is in fact only carrying out permanently and architecturally what had before been done temporarily, for the first step towards rendering some of the old London bridges more suitable for the increased water-way traffic consisted in knocking one or two piers out of the middle and making a wider arch there. That was done both with old London Bridge and old Putney Bridge, long before they were finally removed.

But the design of Waterloo Bridge suggests another point. I said just now that there was nothing in the condition of the waterway of the Thames at London to justify or suggest an unsymmetrical treatment of the bridges. But there is something to suggest this in the levels of its banks. The main line of traffic with which Waterloo Bridge is connected at its north end is at a much higher level than that at its south end. Perhaps few of those who, after alighting at Waterloo Station, are dragged by a straining cab-horse up the gradient leading to Waterloo Bridge, realise that this up-hill tug is all in order that Waterloo Bridge might realise its uncompromising severity of design by being carried at a uniform level right across the river, from the high bank to the low one. In the case of London Bridge there is the same kind of discrepancy between the design of the bridge and the bank levels, but to a less degree, as the ground on the north side falls rather towards the bridge, and the difficulty has been partially evaded on the south side by "fudging" to some extent the lines both of the parapet and the roadway, so that about 3 ft. of the necessary fall is obtained on the bridge itself, without the effect on the symmetrical character of the design being very noticeable unless looked for. Attention was drawn to this point in an interesting paper on the bridges of London, considered mainly from an engineering point of view, read

four-and-twenty years ago before the Institute of Architects by an engineer, Mr. Henry Carr. Speaking with special reference to Waterloo Bridge, he propounded the question whether the right treatment would not have been to have kept the highest point of the bridge as near as possible to its north end, and built it in a descending gradient from that point, to meet as far as was possible the lower road levels on the south side. There would then have been a long and easy gradient, partly on the bridge, instead of the present short and steep one up to the bridge level. Mr. Carr admitted, however, that "he would have been a very bold man who had ventured to adopt such a course;" and I think we must all agree that the majestic character of Waterloo Bridge would have been much impaired thereby. Still it is a question whether the architectural dignity of the bridge should or should not have been impaired for that practical consideration; a question which might perhaps enter into our discussion to-night.

In regard to the second point, the treatment of the soffit of the arch, this will depend somewhat on the general style of the design. In those bridges which are what is generally called "Classic" in architectural character, it seems almost a matter of course that the arch should be built with a plain flat soffit; and as there is no constructional advantage in doing otherwise, there is perhaps nothing to be said against this treatment when it is in harmony with the rest of the design. Certainly nothing in the way of ornament should be introduced on the underside of the arch, which is the constructive portion of the bridge, and should have an appearance of rock-like strength and stability. But if a bridge be designed with any of that more stern and sinewy character which we associate with Gothic work, the method frequently employed, as already observed, in Mediæval bridges, of building the arch in parallel groins with a recessed surface between them, certainly gives additional force to the design, and may even be a saving in material, though such saving would no doubt be counterbalanced by the increased superficies of work on the groin ribs. This effect of parallel groins on the soffit has actually been adopted in some of the modern bridges with iron arches, the arches or cantilevers forming visible ribs, in a manner which is perfectly logical as an expression of the construction.

The pier of the bridge has been the great *crux*, in the architectural sense, of bridge-designers, and it is where the modern bridge-builder most frequently fails, owing mainly to a departure from simplicity, a desire to do something clever and "handsome." As before observed, a bridge must have a cut-water on the lower portion of its piers in the direction opposed to the current; and in many old and simply-designed country bridges, the whole pier towards the current was built out at an angle, ending in a sharp point, and either carried up in this form to the parapet, forming a triangular "refuge," or stopped below the parapet by set-offs, and becoming a triangular buttress. The down-stream side of the pier would be left flat. We must all have noticed such bridges in stone-building districts, and observed their picturesque effect. There are instances to be found, I think, among old bridges, and certainly among modern ones, where bridges in a running stream have been built with a cut-water both up and down stream—for symmetry, I suppose. It is better, no doubt, that the water should have a curve to run round on uniting on the down-stream side of the pier, or it may wear away the angles, but it is quite sufficient for this purpose to make a semicircular finish to the plan of the pier on the down-stream side; there should be nothing like a cut-water, which should be confined to the up-stream side, otherwise you lose a natural source of character in the design. In the larger bridges which are erected over large rivers and in connexion with large cities, the cut-water form is now seldom or never carried higher than is necessary to clear the highest water-level of flood or tide; to do more would be a serious waste of material in a bridge on a large scale. There is, however, a general sense that it is in the fitness of things that the pier should be emphasised by carrying its face beyond the face of the arch, both to divide the arcade in an architectural sense, and to give both the appearance and the reality of greater weight and mass to the pier. How is this emphasis to be expressed architecturally? In the Pont Neuf at Paris (a small bridge compared with our London ones) the treatment is very simple and very effective; the cut-water form is carried up to a considerable height, and a semicircular balcony is corbelled out from it. The semicircle is a better form for an alcove or refuge than the triangular space which would be given by the shape of the pier itself; and the whole arrangement is both picturesque and practical; but it would not apply to bridges of such large scale as ours. There we have to leave the greater part of the cut-water as a bare shelf, bevelled or curved to allow any water that may get on it to run off; only the portion close up to the pier is generally treated as a square plinth to receive whatever kind of projection of the pier we may put on it. Now constructively this projection of the pier is, if anything, a buttress, for any constructive function that it can have is to increase the lateral stability of the pier; and it might quite suitably be treated as a buttress, and sloped off to the main plane of the bridge. Most of our large modern bridges being, however, on Classic lines, the buttress would seem to be out of keeping as a matter of style; and in that case the simplest and most effective treatment is just to project the whole mass of the pier outward as a square projection, carrying the cornice round it. This is the way it is treated in London Bridge and Putney Bridge, and in some of the best of the larger up-river bridges—Kingston, for instance. But with too many of our modern bridge-builders there seems, unfortunately, to be a rooted idea that this projection of the pier is a place designed by Providence for the display of the columnar orders in some form or another. A couple of flat pilasters on the projection might give it a certain architectural grace without robbing the structure of its solidity, though certainly detracting from the appearance of power; but to put detached or-semi-detached columns in place of the projection of solid masonry is to deprive the pier of the effect of mass, and to place a feature intended to support vertical weight in a position in which what you really want is lateral strength. And when, as we shall see in some instances, even the advantage of the graceful proportion and effect of the Classic column is abandoned, and short thick stumps are introduced, the result becomes palpably absurd as well as ugly.

The cornice of the bridge, if it is a bridge of Classic type, should range with the level of the roadway, representing the crown of the solid construction, so that the parapet can be designed equally for inside and outside appearance. The cornice should be of bold and simple character, as befits a grand engineering construction on a great scale; but, on the other hand, we must guard against the mistake, so often made

in engineering works, of seeking for "boldness" by means of mouldings of enormous size. The result of that is merely to make the work look coarse and to reduce its apparent scale. Engineers may no doubt shelter themselves behind the example of Michelangelo, who did the same at St. Peter's; but that was one of Michelangelo's mistakes. In regard to the parapet, I think a bridge should always have a pierced parapet of some kind; a solid parapet gives it a heavy appearance, a pierced parapet offers a pleasing contrast with the heavy masses of masonry of the constructional portion, and at the same time marks the fact that it is an addition and not an essential portion of the construction. But the more simple the design of the pierced portion the better; an exceedingly ornate parapet design is out of place and seems to force itself on the attention too much, besides detracting from the breadth and solidity of effect proper to a bridge. Unless a bridge has something decidedly Gothic in its general design there is really nothing better for the position than a simple repeating baluster of the Italian type. The lamp standards should be placed over the piers, not in the centre of the arches. They are so in all the older bridges as far as I have observed; it seems to have become a modern practice to place them over the centre of the arch; a mistake both architecturally and practically. On the pier they assist in emphasising its vertical line, and seem in their proper place architecturally, and while the position makes no difference to the traffic on the bridge, it is certainly better for those in boats passing under the bridge to have a cross light from both sides of the arch than a single one over their heads.

It may be a question whether the spandrels of the arches should be regarded as a field for the introduction of ornament. I can only say for my own part that I can hardly imagine any kind of design for a monumental stone bridge which would not be spoiled and weakened in effect by cutting up the spandrel with ornament. In the case of bridges with iron cantilevers the space between the upper and lower member no doubt seems a suitable one for an ornamental filling, though the efforts that have been made in this direction have not so far conduced to the happiness of the spectators. Where there is a sufficient mass and projection in the piers it may be suitable enough to place a niche and a statue, provided that you are going to afford sculpture of the highest class and of a grand type of design.

Having gone so far into the abstract, let us now turn to the concrete part of our subject, the London bridges. The London jurisdiction over the bridges extends from Hammersmith Bridge to the Tower Bridge; those from Hammersmith to Waterloo being under the County Council, while Blackfriars, Southwark, London, and Tower Bridges are under the Corporation of London. The various railway bridges have I presume to be passed by the authority under which they are built, but the companies' engineers are responsible for their design.

We may look first at a few of the up-river bridges, as I have photographs of them here; they are pleasanter objects than some of the lower ones. Wallingford is a pretty specimen of the old-fashioned country bridge with narrow arches. I do not know its date. Kingston Bridge, built by Lassidge in 1825, is very modern in style by comparison, and may be called a fine and stately work of its class. The arches are elliptical, the centre one being 60 ft. span. It will be observed that the surface moulding which terminates the cut-water does not, as in most of our recent bridges, form or coincide with the springing of the arch, but is independent of it; a treatment which gives less unity of effect. I should have liked the pier better without the panel in it; and the thrusting forward of the balustrade on the cornice, over the pier, to get a deeper recess, has certainly not a good effect; but in the main this is a very pleasing and dignified bridge. Richmond Bridge, built in 1780 from the designs of James Payne, is a work of somewhat the same type but with segmental arches, and with a greater unity of design about it, and in spite of the Classic character of its detail there is a lingering of Gothic sentiment about it which is interesting. The same may be said of Kew Bridge, built two or three years later by the same architect (civil engineering was hardly a distinct profession then), in which it will be seen that the square projections marking the piers are actually treated at the foot in a kind of buttress set-off form, widening them out to give greater stability where they are exposed to the force of the tide. The gradients of this bridge are rather steep practically, to modern notions, but this rise and fall of its lines forms a great part of its beauty, and it may be said to be a bridge in which in point of good taste there is absolutely nothing to find fault with.

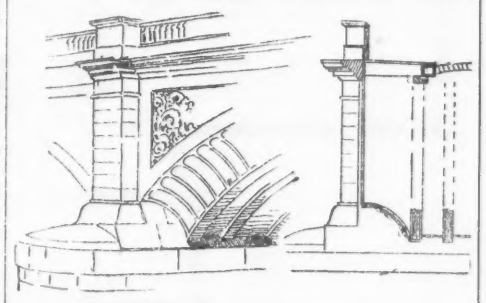
Alas! what a sad fall it is when we come down to Hammersmith, and get the first start into the official domain of London. Let us look first at the old Hammersmith Suspension Bridge, designed by W. Tierney Clark, in 1824. This had the defect, in common with the Tower Bridge, that the real suspending point of the chains was hidden behind a veil of masonry; but apart from that, though it is not a remarkable design, it is, at least, an inoffensive one; there is nothing about it that can be said to be in bad taste. But look at the thing that has taken its place! An iron construction simulating stone, except that the proportions of the towers are far too slender for stone; painted stone-colour to aid the illusion (?), stuck over with enormous crestings and spikes, the towers "decorated" with cast-iron realistic flowers in panels, the land attachments for the chains masked by enormous scrolls and gigantic cabbages, acanthus leaves in cast-iron, the whole lump being 16 ft. in length, and the most horrible piece of coarse detail that it would be possible to set eyes on. A late French novelist, Guy de Maupassant, laid it down as a maxim, "Whenever you see an engineer, shoot him," and though, as a general rule of conduct, this may seem harsh and rather one-sided, it is impossible not to recall it when one looks at the new Hammersmith Bridge.

Happily our next step down the river brings us to better things. Putney is blessed both in the memory of its old bridge and in the presence of its new one. Old Putney Bridge, built in 1729 by Thomas Phillips, the "King's Carpenter," was the first bridge near London after London Bridge, and was, as you all know, one of the picturesque timber erections which were not uncommon at the time. Before looking at it, we may glance at a smaller bridge of the same kind, the original Ebury Bridge, known also as "Jenny Whim's bridge," as it led to the "Jenny Whim" tea-house. The latter, Mr. Wheatley tells us, was not removed till 1865; the bridge, in what is now the heart of Pimlico, was probably standing within the memory of people still living. Of Old Putney Bridge I can show you what is probably the last sketch of it ever made, which I made from a boat moored by a long line to one of the piles, getting a view which could not be had from the banks. The old bridge was a great nuisance to the water traffic in latter days, and was getting very shaky, but it was one of those picturesque things that one is sorry to lose; it had served its purpose well in its time, and considering how strong the tide runs there, and that at spring high-water the river is 30 ft. deep over a considerable portion of its width, it is highly creditable to Thomas Phillips that his piles stood as long as they did. The new bridge, built a little way above the old one, is a noble and solid erection of granite, treated in the simplest manner, and is on the whole the most satisfactory bridge we can show next to London Bridge; for though of course not so grand as Waterloo, there are faults in the latter which there are not in this. The arches were built on curved box girders as centreings, and it is curious that at least two architects mistook the centreings for the bridge, one of whom wished me to publish an indignant letter of remonstrance against this Vandalism of an iron bridge at Putney. It is noticeable that both this and Hammersmith Bridge are credited to Sir Joseph Bazalgette, but surely it is impossible that they could both be the outcome of the same mind!

The railway bridge just below, with its straight girders carried on black cylinders, recalls us to the point touched on just now, as to the special conditions of railway bridges. A bridge for ordinary traffic has to provide for a load which may move in almost any direction, and may be all over the roadway. A railway bridge provides for a very heavy moving load, which is always in one fixed plane parallel to the length of the bridge. It requires a very rigid road, and the problem admits of carrying the strain to isolated supports at fixed points. Hence the predilection of railway engineers for the straight girder and the iron column. The railway bridge at Grosvenor-road, by which the trains out of Victoria cross the river, is one of those on what are called arched girders, though, in fact, the curved member ought rather to be regarded as the compression member of a kind of double cantilever; it certainly does not act as an arch in the same sense as a built arch. The Grosvenor Bridge, which has massive stone piers very suitably treated, as skewbacks for the girders, is, *quâ* railway-bridge, a very passable-looking structure; but every one who has sat in a train giving up tickets at Grosvenor-road must have noticed the extraordinary amount of undulatory movement set up by passing trains—the leverage acting on the lower member of the girder. You will never notice any such oscillation when standing on Charing Cross Bridge while there are trains passing: the beam is more rigid than the cantilever. Hence, though we may dislike the effect of the railway-engineers' box or lattice girder, we should bear in mind that it is the best thing for the work to be done. I only wish that they would meet us half way, and build up a rough-dressed granite pier, or even a concrete one, and lay the girders on it. This method has been employed in some American railway bridges of which I have seen illustrations, and looks very well; certainly it is far less destructive of natural beauty than the sight of those brutal-looking black iron tubes going down into the water.

Wandsworth Bridge is an unhappy-looking mongrel structure of which the five centre spans are crossed by a lattice girder carried on cylindrical iron columns, which in this case are diversified at the top by the semblance of a monster Corinthian capital with cast-iron foliage, developing into an octagonal abacus carrying an octagonal alcove or refuge over it. The side piers are of stone, fairly well treated, with a cantilever cornice under the bed of the girder and a square pedestal over. It dates from 1873, and is perhaps the most thoroughly uninteresting bridge on the river; it has hardly even an interesting ugliness.

Old Battersea Bridge was a picturesque timber bridge of the same type as Putney, and perhaps inspired by it, though erected about forty years later. The builders are said to have been Phillips & Holland. It was built in a curve, the convex side facing down the river; whether it was supposed that the scour of the flood tide was stronger and more destructive than that of the ebb I do not know; my experience of the Thames would lead me to think the reverse. It was removed in the winter of 1885-6, and a record of its appearance has fortunately been preserved for us by Mr. Ernest George among his etchings of Old London. The present bridge, designed by Sir J. Bazalgette, was opened in 1890, and is a characteristic specimen of the engineering type of "handsome" bridge—I use the word "handsome" in a Pickwickian sense. It is one of the so-called arched iron bridges with a brick pier faced with granite, resting on a concrete foundation. One device used to give an "architectural" effect to this bridge is somewhat instructive. The outer arch-rib is considerably within the line of the outer face of the work, and a very large cove is carried out from it to the spandrel face. The effect of this is no doubt "very bold," but when we look at the section we find that this is simply



A little dodge at Battersea.

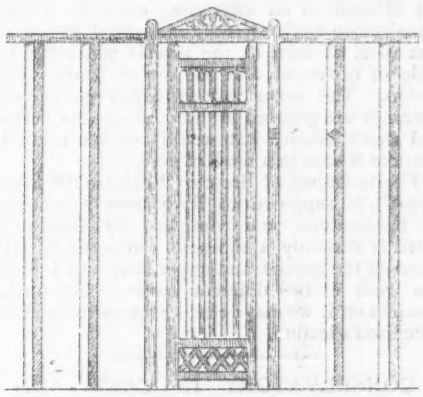
a piece of boxing of rivetted iron plates, strong enough to carry the outer edge of the footwalk and the balustrade, but otherwise a mere shell with a hollow space behind it. It is impossible for architects to understand why these things are done; we are too simple-minded. There seems by-the-way to have been a Moorish spirit predominating over the ornamental portions of this bridge; the spandrel filling is of Moorish foliage, and the balustrade consists of little coupled columns and pointed arches filled with alternating geometric designs. Why this outbreak in a structure which has nothing Saracenic about it in other respects is not obvious.

The Albert Suspension Bridge, designed by Messrs. Ordish and Le Feuvre, and opened in 1873, is noticeable for its admirable system of suspension rods and chains mutually stiffening each other, and maintaining a much steadier roadway than a suspension-bridge generally possesses; and in the piers there is apparent a creditable attempt to treat them in a manner characteristic of iron, in thin lines and shafts, which would have been (as usual) more successful but for the attempts at ornament in the shape of caps and finials. As an iron suspension-bridge, it is, however, an infinitely more reasonable kind of structure than Hammersmith Bridge. In the Chelsea Suspension Bridge, built by Thos. Page in 1857, we are in the midst of gimcrack again, the general style of the design being what one may call the "decanter-stopper" type, being all over finials which look like decanter-stoppers run mad. Observe the things which crown the main piers, and which, according to the scale drawings at the County Council office, are about thirty feet high altogether. These details are ugly enough in themselves, but when they are used on this scale they have of course the effect of dwarfing the scale of the whole structure. But it would be useless to waste another word on this piece of tawdriness. The plain unpretending suspension-bridge at Lambeth is really a more pleasing structure, for there the uprights for holding up the chains are plainly treated in the constructive shape best adapted for the purpose, and there is at all events no gimcrack decoration stuck on to them.

I regret that I have been unable to get any illustration of Vauxhall Bridge (opened in 1816), because it is a structure with a good deal of character, and in point of good taste and consistency it is certainly the best of the compound stone and iron bridges of London. That may be one reason for the desire to remove it; it is not "handsome" enough; but the ostensible and perhaps valid reason is that its spans (78 ft.) are too small for the requirements of the river traffic.

Sketch of Pier, &c., Vauxhall Bridge.

There is no show or tawdriness about it; the piers are suitably and sensibly designed; the filling in of the spandrels with vertical bars as ties is in keeping with the generally straight-lined character of the structure; and the balustrade railing, though simple enough, is a really admirable bit of design in cast-iron, for such a situation.* To whom the credit of the design is due is hardly precisely known, as owing to disagreements and changes it passed through several hands, Rennie's among others; the completing engineer was James Walker, but he may not have made the design actually. Looking at it, we may say with the mob in "Julius Cæsar":—



Railing, Vauxhall Bridge.

"Alas! my masters,
I fear there will a worse come in his place."

Old Westminster Bridge, begun in 1738 from the designs of Charles Labelye, was at first intended to have been a wooden one, and was even commenced as such, but the more ambitious design for a stone one was carried out. It had thirteen main arches and two little ones next the banks; the centre span 76 ft. wide; nearly the same, it will be observed, as those of Vauxhall Bridge, for which it perhaps gave the gauge. The arches were semicircular, with rusticated quoins, the piers semi-octagonal on plan at the ends, on a plain cut-water. The two centre piers and two at each end had semi-domical shelters over them, which I am informed are at this moment acting as shelters in Victoria Park. It will be observed that on the other piers the supports for the lights take the same outline as these shelters. In an architectural point of view this was a fine bridge; it has figured in many old pictures; but the foundations were not well laid, and it caused much trouble and expense in repairs. The new bridge, designed by Page, was commenced in 1854. This is a bridge with iron arches carried on stone piers with a granite finish in the upper portion; in the octagonal plan of the piers there appears to be an intentional reminiscence of the old bridge. As in the case of the Tower Bridge, it was evidently supposed that the design of this structure must be governed to some extent by the great building in its proximity—in this case a modern and not an ancient Gothic structure; and as the Houses of Parliament were being erected in the Tudor style, the iron arches of the new bridge must be, if not four-centred, at least

Continued on page 146.

* The sketches here given do not profess to be exactly accurate: they are the result of hasty memoranda made on one of the recent days of almost Arctic cold, when deliberate sketching was impossible; but they illustrate the character of the design sufficiently for the purpose.

Illustrations.

EXAMPLES OF ITALIAN RENAISSANCE ARCHITECTURE.

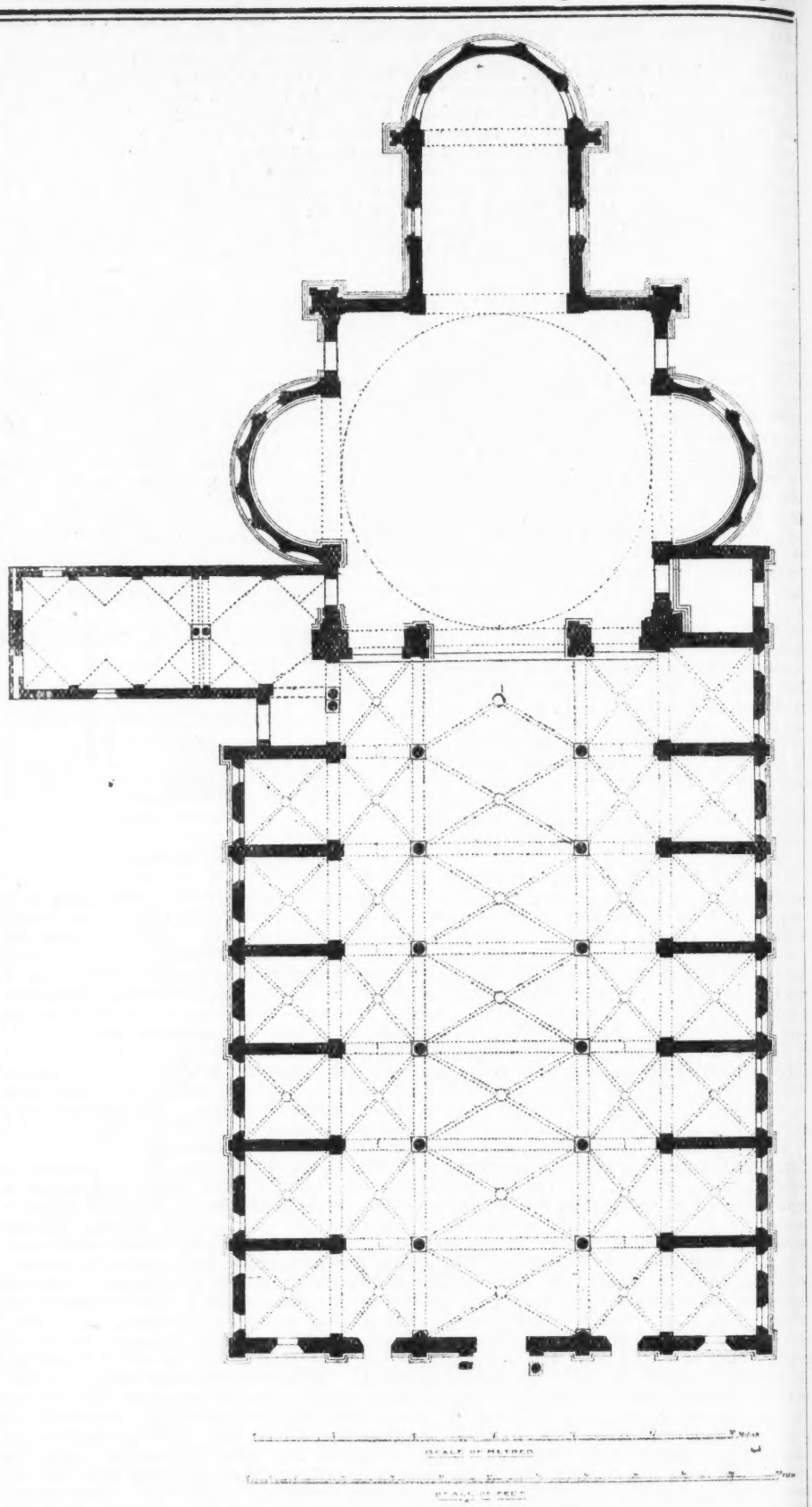
THE four buildings illustrated this week are given in connexion with Professor Aitchison's Royal Academy lecture, and at his request.

The church of Sta. Maria delle Grazie at Milan is one of the most interesting examples that could be found of early Renaissance work in which the Mediæval spirit of picturesqueness is still predominant. Professor Aitchison, we observe, refers to the exterior as being altogether Bramante's work: it has in parts a very early appearance for that attribution; another theory is that he was responsible only for the cupola; but in any case the apse is, as Professor Aitchison says, a most graceful piece of building.

The church of Sta. Maria della Salute has not been very often illustrated in its interior, though its exterior is so frequently painted, so that an illustration of the interior may be acceptable here.

The upper portion of the façade of Sta. Maria dei Miracoli is an interesting example of early Renaissance work strongly influenced by Byzantine taste, as seen in the marble veneering, the style of ornament, and the use of inlaid colour design. The naïve way in which the circular openings are grouped in the pediment is curious and characteristic, but would not we think be admired if seen in a modern design.

The town-hall of Brescia ("Palazzo del Municipio"), is supposed to have been commenced by Formentone and continued by Sansovino; there is certainly a sufficient difference of style between the ground and upper stories to indicate the work of two different hands. For further remarks on it we may refer the reader to Professor Aitchison's lecture.



Plan of Sta. Maria delle Grazie, Milan.

CONSERVATORY IN CAST- AND WROUGHT-IRON, CHESHAM PLACE.

Sir Sydney H. Waterlow had some small living-rooms at the back of his house converted into a boudoir, so as to be *en suite* with the other drawing-rooms and with a conservatory opening out from the boudoir. At the same time he wanted a marble group he had bought abroad placed in a position where it could be well lit. To accomplish these two ends the conservatory was thrown out over the kitchen-court, and as the conservatory faced the street on one side and the courtyard of the Russian Embassy on the other, it was determined to make it in cast- and wrought-iron and ornamental.

The disposition of the group is shown on the plan (see next page), and the lithograph shows the view of the conservatory. An elevation of the wrought-iron railing to a larger scale is added.

G. Aitchison.

THEATRE ROYAL, NEWCASTLE-ON-TYNE.

The proprietors of the Theatre Royal, Grey-street, Newcastle-on-Tyne, recently decided to make very extensive alterations to this theatre, which will make it not only one of the handsomest and most comfortable, but also one of the safest in the provinces. On the ground level from Grey-street there will be a new vestibule, the external elevation of which will be of Classic design, in harmony with the old front.

On the ground level from the vestibule is entered a large and richly-decorated circular entrance-hall, from which on each side is approached by wide staircases the dress-circle, and the stalls are reached by means of staircases on each side of the proscenium wall.

On the dress-circle level is a large and richly-decorated *foyer*, and saloons and lavatory accommodation are also provided for each tier, and everything for the convenience and comfort of the public has been provided.

The theatre will be lighted by electricity, with gas for use in case of emergency.

The seat-coverings, silk hangings, &c., will be carried out in a brown pink tone, and the colouring of the house will be in ivory and gold.

The whole of the auditorium and front of the house will be gutted and reconstructed in concrete and iron, and will, when finished, consist of four tiers, viz.:—Pit and stalls, dress-circle, upper-circle, and gallery, and will hold in all about 1,900 persons.

The interior of the theatre is of Renaissance design. The ventilation is being carried out on a simple system consisting of extracting the heated and vitiated air by means of exhausts, provision being made for allowing sufficient fresh air to pass into the building.

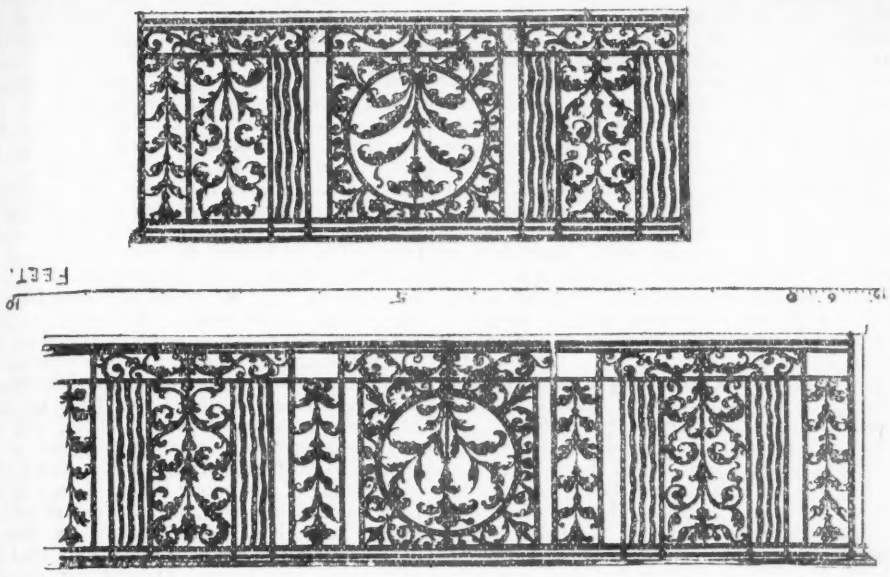
The whole of this construction will be fireproof, and the house will be protected with hydrants on each level and sprinklers in the roof and over the stage. Each tier is provided with two exits.

The plans have been drawn out by Mr. Walter Emden, of London, in conjunction with Mr. W. Lister Newcombe, of Newcastle, and the work will be carried out by Mr. W. C. Tyrie, of Newcastle, the constructional ironwork by Messrs. Lindsay, Neal & Co., of London, and the decorative plastering by the Veronese Co., of London.

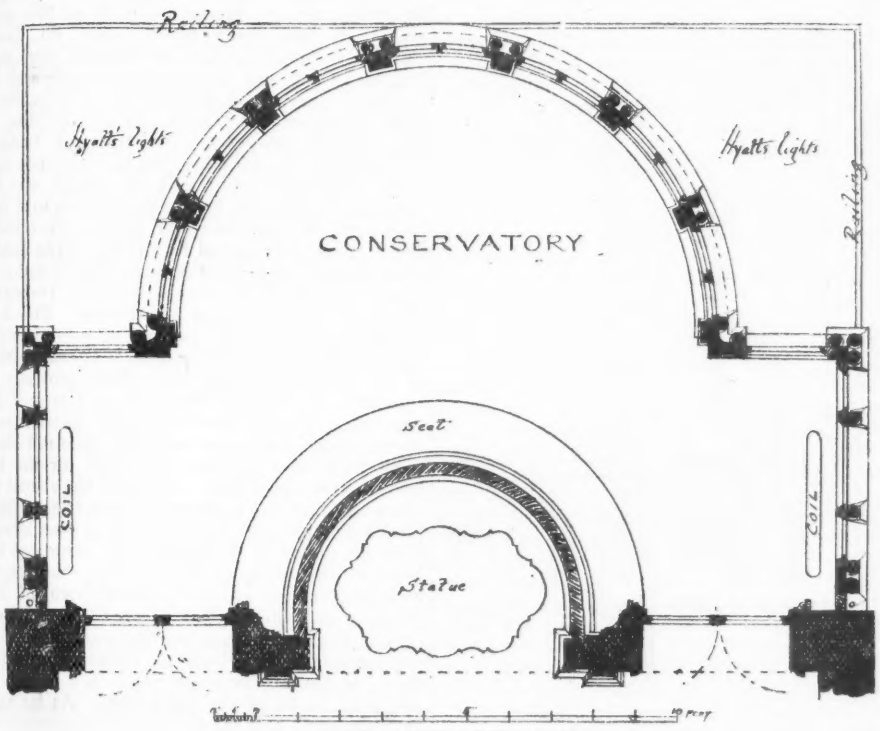
W. E.

SUTTON PUBLIC OFFICES COMPETITION.

The designs for the public offices for the Sutton (Surrey) Local Board were on public view last Wednesday at Sutton. The problem was a somewhat peculiar one, in that the site was larger than required for the proposed buildings, and was only to be partly covered, the remaining portions being left for a future free library, magistrates' court, and police-station, while a frontage for shops was to be left on the main road. The conditions were drawn up by Mr. Albert D. Greatorex, C.E., the Local Surveyor and seem to clearly define the requirements. The design placed first by Mr. Phené Spiers, F.R.I.B.A., who has acted as the assessor, is by Messrs. Curry & Tatlock, of Sutton. The merit of this design seems chiefly to lie in the general distribution of the block plan, by which the condition of obtaining the greatest possible frontage for the land to be let as shops has been carefully borne in mind, 119 ft. being left towards the main road for this purpose as compared with 75 ft. in the design placed second. The principal weakness in the plan lies in the imperfect lighting of the surveyor's clerk's office, as also in the lecture-theatre to the Tech-



Conservatory, Chesham Place.—Detail of Railing.



Plan of Conservatory, Chesham Place.

nical Institute, over which are placed the class-rooms. This lecture-theatre is only 15 ft. in clear height. The partitions to the class-rooms over this theatre are carried on a girder supported by columns as shown in the section. These columns, however, do not appear on the plan.

The uncovered ground left for the magistrates' court and Free Library is very small, and would probably not be sufficient. The elevations are in an ordinary type of red brick and stone mullion treatment, and the authors estimate their design to cost 8,910*l.* The design placed second by the assessor is by Mr. H. T. Hare, and, although perhaps slightly inferior in plan to the selected one, is far superior to it in design, being executed in a very pleasing phase of red brick walling and stone mullions. In point of price Mr. Hare's design is estimated at 900*l.* less than the premiated competitors. The plan is very much broken up, however, and lacks a certain amount of dignity in consequence. The draughtsmanship exhibited in these drawings contrasts strongly with the badly-drawn elevations and perspective of the design placed first. Among a large number of other competitors, we notice especially the design of Messrs. Marshall & Bradley, who have adopted a red brick and tile treatment, quite in keeping with the locality. The distribution of the site adopted by the Local Board forced the competitors to produce a number of isolated designs, rendering it difficult to form an impression of what the small two-story blocks would look like. In this respect mention may be made of Messrs. Archer & Hooper's design, which is ambitious and comprehensive, and covers the whole site with a symmetrical treatment in each elevation.

We might say, in conclusion, that we trust that other Local Boards will not follow the example here held out of relegating their public buildings to the rear of the site in order to make money by the letting of the frontage as shops.

THE ARCHITECTURAL ASSOCIATION SPRING VISITS:

PAVILION THEATRE, MILE END.

THE second of the Spring Visits took place on Saturday last to the Pavilion Theatre, Mile End, E., when a party of about eighty members assembled and were met by the architect, Mr. Ernest Rüntz. The theatre itself has a history. It was originally erected on the present site in 1827, it was burned down, however, in 1856 and reopened in 1858, having been rebuilt from the designs of the late Mr. Donald Munro. Of the present building, designed by Mr. Rüntz, we gave some particulars not long since (*Builder*, December 22, 1894, page 460), and therefore it is hardly necessary to repeat them here. We may add, however, that the level of the pit and stalls has been altered, the rake of the floors being specially studied so that each spectator can see well above the heads of the persons in front. In regard to this point we may notice that the floor of the stalls rises 1 in 10, the pit 1 in 8, while the stage itself rises 1 in 10. The average seating is taken 2 ft., centre to centre, and 1 ft. 6 in. wide, the reserved seats and circle being, however, slightly in excess of this.

After the party had made a detailed inspection of the building, the architect, Mr. Rüntz, kindly entertained the members at tea, after which, on the proposition of Mr. Banister F. Fletcher, jun. hon. sec., a hearty vote of thanks was passed to Mr. Rüntz for his kindness in showing the members over the building.

ARCHITECTURAL SOCIETIES.

CARLISLE ARCHITECTURAL, ENGINEERING, AND SURVEYING SOCIETY.—On the 13th inst. a paper on the "Manufacture of Iron and Steel" was read by Mr. A. Wilson, at the Town-hall. The lecturer described first the sources from which iron is derived, and remarked that pure iron is scarcely ever found in nature, though it forms in various combinations one-twelfth part of the earth's crust. The antiquity of its use is shown by many records of ancient and scriptural writings, and Asia probably made more iron two thousand years ago than it does to-day. The various ores of iron, hæmatite, magnetite, limonite, and siderite, and the class of ores known as ironstones, which is the basis of the greater part of the industry of Great Britain, were treated of, with details of their chemical composition. The reduction of iron from the ores was then explained, the construction of blast-furnaces being demonstrated with an explanation of the chemical changes taking place therein. The action of rolling-mills and steam-hammers on the crude iron was then shown to have a very great effect on the ultimate strength of the metal. Passing on to steel, the lecturer described the difference between it and wrought-iron, explaining that steel was without the fibrous character of wrought-iron, which latter contains small grains of various impurities embedded in its fibres, while those impurities were entirely absent in steel, thus making it stronger and more uniform in composition. The different methods of steel-making were described in full, a very clear description being given of the difference between the basic and acid methods of Bessemer steel-making. After some discussion, a vote of thanks to Mr. Wilson concluded the proceedings.

NORTHERN ARCHITECTURAL ASSOCIATION.—A meeting of the Northern Architectural Association was held on the 13th inst. in the Art Gallery Meeting Room, Newcastle, the President, Mr. Jos. Oswald, being in the chair. The President presented the prizes to the successful competitors who submitted sketches and drawings made during the summer of 1894, as follows:—Best set of sketches—First prize, Mr. G. C. C. H. Crawhall, Newcastle (two volumes of Fergusson's "Ancient and Mediæval Architecture"); second prize, Mr. R. P. Twizell, Newcastle (Oakeshott's "Italian Details"). Measured drawings—First prize, Mr. S. M. Mould, Gosforth (two volumes of Colling's "Gothic Architecture"); second prize, Mr. G. Brumell, jun., Morpeth (Colling's "Mediæval Foliage" and Rosengarten's "Architectural Styles"). Mr. J. W. Twist, A.R.I.B.A., of Leeds, then read a paper on "Ecclesiastical Architecture of Yorkshire," illustrated by sketches and limelight views.

ARCHITECTURAL SECTION, GLASGOW PHILOSOPHICAL SOCIETY.—A meeting of the Architectural Section of the Philosophical Society of Glasgow was held on the 18th inst. in the rooms, 207, Bath-street. Mr. Watson presided. A paper was read by Mr. Richard Ferrie, sculptor, on "The Relation of Modelling to Sculpture and the Industrial Arts." The lecturer, after a short reference to ancient Greek work and that of the Renaissance, directed attention to the subject of the connexion of modelling with sculpture and the decorative arts of the present day. He advised the use of modelling to assist the stone or wood carver in his productions, and described the advantages of clay as a material for the production of design. After describing the capabilities of terra-cotta as a decorative material, and noting its use, or rather want of use, in Scotland, the lecturer dwelt on the merits of plaster for the production of modelled work. A number of lime-light views were shown illustrative of the connexion of modelling with work finally produced in bronze, marble, stone, wood, and plaster.

STUDENT'S COLUMN.—Owing to the pressure of other matter in this issue, our Student's Column article is held over until next week.

Continued from page 143.

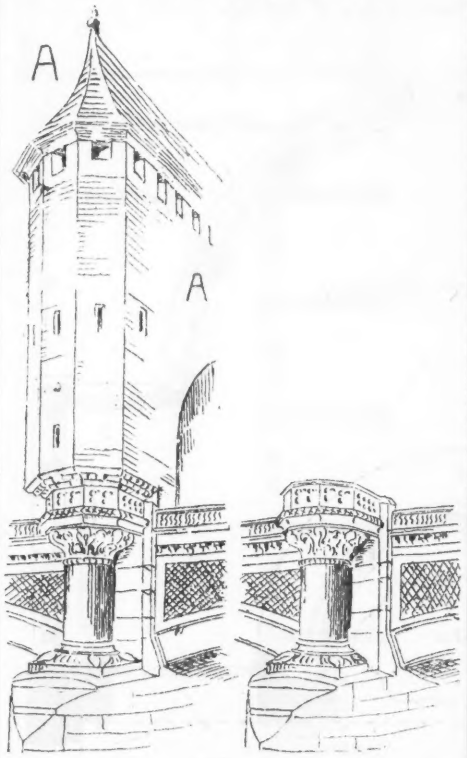
three-centred arches, with a quick curve at the springing. But engineers, unhappily, will never have done shamming in these matters, and the apparent three-centred arches, which come up with a charming curve off the piers (the line is continued downward in the piers with a slightly reversed curve), are not the real construction, they are only a corbelled-out pretext; the real constructional arch-ribs continue the main curve behind them on to the centre of the piers, where they meet each other on a common skewback of metal. I am glad to say that the bridge has revenged itself on the engineer in a sense, for it is owing to this meeting of the iron arches that the traffic causes such an oscillation on Westminster Bridge, the disturbance being communicated from one arch to another; and when Blackfriars Bridge was built, the engineers, taking warning by this example, took care to carry up the stone piers solid between the iron-work. It must be said in regard to Westminster Bridge that there is nothing obtrusively vulgar in its detail; its general appearance is graceful if we could only forget how superficial is that gracefulness; but for a bridge over a historic river, at such a historic place as Westminster, it is but a poor weak concern, quite unworthy of its associations, and in an architectural sense there is no question that the bridge which preceded it was far superior to it.

We may pass over Charing Cross railway bridge, to which reference has already been made, but a word is due to the memory of old Hungerford Suspension Bridge, which occupied nearly the same situation, and was a good specimen of work of its kind, with towers of an Italian campanile style, rising from massive cut-water piers. It represents the same kind of quiet unobtrusive Classic treatment as old Hammersmith Suspension Bridge, and like that, was at all events unobjectionable in point of taste. Brunel was the engineer; the bridge was commenced in 1841, and completed in 1845; the centre span was 676½ ft. The chains and portions of the other materials are now doing duty in the form of Clifton Suspension Bridge, the making of which, commenced in 1836, had stopped half-way for want of funds, and it was only by the cheap acquirement of the *disjecta membra* of the Hungerford Bridge in 1862 that the completion of the Clifton Bridge was effected.

It is indeed a contrast to pass from the graceful but weak and illusory structure at Westminster to the monumental erection which was commenced in 1811 under the proposed title of "The Strand Bridge." But while the masons were yet at work, England had taken share in actions which stirred the pulse of the whole world, and the new bridge, opened in 1817, was destined to be christened with the undying name of "Waterloo." It was fitting that the memory of an event which signalised the rise of modern England to her highest point of power, pride, and glory—such a height as perhaps we shall never reach again—should have been associated with a structure so grand and monumental in character, so entirely without littleness or tawdriness, as Waterloo Bridge. It was an erection worthy of a conquering nation, as we then were. As already hinted, it is open to criticism as a design. It shows the illogical use of the columnar order as a decoration to the piers: at the same time the massive Doric order made use of is less objectionable and more in keeping with the situation than many other examples of similar treatment. It has the lamp-standards on the crown of the arch instead of over the piers, with a solid blocking, interrupting the open balustrade, to place them on; but then it may be urged that the whole structure is of such massive character that such a thing as a lamp-standard is a toy that may be placed anywhere, and that the mass of blocking over the keystone even enhances the general aspect of solidity. Whatever we may think on these points however, we must admit that Waterloo Bridge is a noble example of that quality of unity and simplicity in architecture which was the subject of discussion in this room a few nights ago. The engineers were the two Rennies, father and son, who were a few years later to distinguish themselves yet more by the even finer structure of London Bridge.

Old Blackfriars Bridge, commenced in 1760 from the designs of Robert Mylne, one of the famous Scotch building family of that name, was a fine structure, at once picturesque and dignified, of somewhat similar character and proportions to old Westminster Bridge, though differing in detail. It consisted of nine elliptical arches. Gwynn, who produced a design in competition with Mylne, proposed circular arches; and Dr. Johnson, who knew as much of the matter as an owl, defended Gwynn's design in three letters in the *Gazetteer*,* his motive being, no doubt, that Mylne was a Scotchman. The arches had massive quoins, the rusticated joints of which were carried in straight lines across the soffit of the arch. The piers were decorated with an Ionic order in coupled columns, which perhaps gave the hint for the coupled columns on Westminster Bridge; two of these columns are, I believe, still in existence in London.

It is curious that, as the bridge had a considerable rake from the centre, and the cut-waters carrying the base of the columns were at the same level, the columns were diminished in height as they approached the bank, a procedure which must have produced a rather clumsy effect, and is oddly out of keeping with the reverence for the proportions of the order which usually prevailed in the last century. Still, in the main, this was architecturally a most pleasing bridge to look at, though, unfortunately, it seems to have been very badly constructed, and after extensive and costly repairs in 1833 and the following years, it was pulled down in 1864 to make way for the present bridge, a structure typical of the "handsome" type of modern bridge. Here the misuse of the column as an ornament to the pier came to a climax. Look at sketch A and it is obvious that such a massive



granite column is adapted to carry a great weight over it; look at B and see what it really carries. The details belong to the school of what was once unkindly called "Manchester Gothic"; the balustrade is a pretentious thing of twisted colonnettes and trefoil arches; the cross-bracing in the spandrels of the girders is ingenuously picked out with gilt stars. Everything is designed to produce a character of showiness and glitter. It is almost pathetic to find that there is a *motif* in the carving of the Brobdingnagian capitals; those on the west side of the bridge are carved with representations of river plants and birds, those on the east side with seaweed and fishes. Apparently those who were responsible for the design fancied they were producing a work of art. But to think that the same city that built Waterloo Bridge with acclamations could in half a century have come down to this!

Southwark Bridge, built in 1814 from the designs of Rennie, is a structure which hardly receives the attention it deserves; for a composite stone and iron bridge it is not badly designed; the stone piers are well and solidly treated, and the arch is remarkable not only as being, I believe, the first iron arch built on that scale, but as being of cast-iron and a genuine arch, not a truss. The voussoirs of course are not of the proportions which must be employed for stone; they are much longer than their depth, since iron voussoirs can be held in their place in a manner which cannot be done with stone; they are cross-braced laterally, and have a covering-piece at the joints; but they act as a rigid arch in compression, and the roadway under heavy traffic seems as firm as the solid ground. Any one who will go down the steps at the side and take a close look at the arch from that point, will, I think, be impressed with it as a grand and fine piece of work. The treatment of the heavy cast-iron parapet railing, very simple in design, is good, and rather akin to that of Vauxhall Bridge: and the lamp standards, as a piece of design for cast-iron, are certainly above the average.

We now come to *the* bridge *par excellence*, known from almost the earliest times of English history as "London Bridge," and which perhaps in regard to its history, the picturesqueness of its ancient appearance, and the grandeur of its final development, may be called the most interesting bridge in the world. According to Mr. Wheatley, there was probably a bridge on the site in Roman times, and certainly a wooden one existed before the Norman conquest. The historic London Bridge, of stone, was built on piles between the years 1176 and 1209, and the original construction, or a great portion of it, appears to have existed till it was removed after the building of the present bridge, though it had been patched, repaired, and altered at various periods to such an extent that at last little of its old appearance can have remained. Had any painstaking and learned archæologist presided over its demolition, it is possible that its whole architectural history might have been traced out from its own remains, in the process of taking it to pieces; but no systematic study of this kind seems to have been made. We do know positively however, that its history was continuous; there was no complete removal and rebuilding from the time of Peter of Colechurch, who is credited with the design and building of the original bridge, to the time of Rennie. Considering that the piling was probably not very scientifically done, and that the bridge was for centuries loaded with houses hanging on to it and projecting far over the water, it is extraordinary that it managed to stand for so long. The centre pier was lengthened out on each side in order to form a foundation for the chapel of St. Thomas à Becket in the centre of the bridge. The first illustration I will show you is from a print in the Crace collection, copied from an illuminated MS. in the British Museum, and which professes to represent the bridge in the reign of Henry VII., about 1500. The details of course must be taken *cum grano*, as the illustration naturally does not show them fully, and we have to allow for the engraver's translation also. It shows the chapel on the centre-pier, which, however, from the architectural indications, must evidently have been rebuilt since the period of its foundation. Although the bases of the piers, or the wooden "starlings" protecting them, are not shown here of the immense size which in latter days they are known to have been, there was evidently at this period the cataract arising from the choking up of the water at the higher level, which is a feature in almost all views of the old bridge. As far as I have observed, this cataract in old representations is invariably shown as on the east side of the bridge, though it would seem probable that at the top of high water the drop must have been to some extent in the other direction. This throttling of the tidal flow by the piers, which involved a great danger to boats passing the bridge, was not without certain compensating advantages. It is said that one of the causes which hastened the dilapidation of Old Blackfriars Bridge was the increased scour from the tide after the removal of Old London Bridge; it is certain that the occasional flooding of the low-lying districts of Lambeth was in some degree a consequence of the removal. During a considerable portion of the sixteenth century one of the great sights in connexion with the bridge was the sumptuous timber erection called "Non-Such House," towards the City side of the bridge, which is shown, together with a restoration of the general aspect of the bridge, in Mr. Brewer's drawing of London Bridge at that period.* It was probably burnt in the fire on the bridge in 1632. A very naïve engraving in the Crace collection gives a kind of side elevation of the bridge with its irregular groups of houses, and the river labelled "Tamesis Fluvius, *vulgo* Temms;" and an engraving of considerably later date in the same collection gives a good idea of the appearance of the bridge before the houses were removed.

Great alterations were made in the bridge in 1758, under Mr. George Dance, the City Clerk of Works, when the houses were removed, the roadway and parapets new formed, and a wide central arch made. This aspect the bridge retained till

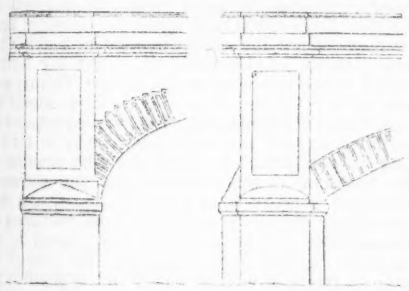
* Wheatley's "London, Past and Present.

* Published in the *Builder* of May 10, 1884.

its demolition, as shown in the drawing by Major Yates, in 1823. This is taken on the west side, and shows smooth water there; but the old danger from the rush below the bridge still remained. An enlarged view of a portion of the Southwark end, taken during this period, is interesting as showing the patchwork of various styles and dates, the old cut-water piers, and the immense timber "starlings," filled up with stones, which were constructed round them to protect them from the stress of the tide; it also shows the Mediæval treatment of the soffit of the arch in groins, of which mention has already been made.

All this patching, however, did not avail to prolong the life of the old bridge much, and the present one was commenced in 1824 from the designs of Rennie, and carried out by his son Sir John Rennie. It was built somewhat to the westward of the old one, which was left standing till its completion (it is curious that when the place of a bridge is shifted in this way, it is always to the westward). It consists of five semi-elliptical arches, the whole of granite, the piers standing on timber platforms on piles about 20 ft. long. Rennie says, "The great magnitude and extreme flatness of the arches demanded unusual care in the selection of the materials, which are of the finest blue and white granite from Scotland and Devonshire."

London Bridge is a structure one cannot speak of without enthusiasm. The late Mr. Street, speaking from the chair in this room, referred to it as "a sublime bridge," and it merits the phrase. It is nearly faultless. Not only is it a grand piece of construction, but there is nothing little or false in any way in its architectural treatment. The piers are simple projections, with no pretence of columnar treatment. Everything about it is in a grand, simple, and massive style. The only criticism I ever met with against it is that the arch voussoirs disappear behind the line of pier instead of resting on a visible impost. With an elliptical arch this could, of course, only have been avoided by proportionally widening the piers, as it springs



vertically. That is, perhaps, the sole advantage which a segmental arch has over an elliptical one; you can show its abutment completely without wasting masonry. But I think the elliptical line has advantages which more than counterbalance this.

The history of the Tower Bridge is fresh in all our minds. The necessity for a new bridge lower down than London Bridge, together with the equal necessity of not stopping the shipping traffic, has led to a grand mechanical contrivance which in itself is worthy of all admiration, and has been admirably carried out. Unhappily, it was predetermined that the Tower Bridge must be "architectural"; moreover, "it was to possess an architectural character which would be in accordance with that of the Tower of London itself. . . . In fact, at one time it was stipulated by the Tower authorities that a castellated fortification at the north abutment should form part of the undertaking." Observe the extraordinary reasoning here. Because there was a genuine Mediæval structure on the bank of the river—all that Mr. Shaw-Lefevre has left of it, that is to say — therefore there was to be a sham Mediæval structure on the river. It is something too preposterous for argument; and it shows that the Corporation authorities are even behind their own generation, stupid as that is for the most part in regard to architectural questions. The design made by Sir Horace Jones, however, of which the drawing has been kindly lent by the City Surveyor, though there is a great want of simplicity and concentration even about that, is superior to the one that has been erected in that it is somewhat more simple, and (far more important) that it is what it professes to be; it is a solid masonry tower carrying the ends of the high-level bridge and the attachment of the suspension chains. As a design it is weak in two respects. There is too much detail in the lower portion—balconies, windows, &c., which interfere seriously with the massiveness of effect which is desirable in such a case. What one wants is a plain mass of solid masonry up to the bearing point, and then, if you like, a decorative crowning stage over that. There is also the old defect that the suspension chains appear to be affixed into the masonry, as we know they could not possibly be; a fatal error which is repeated in the design carried out. As to this latter, the engineer appears to have come to the conclusion that it was impossible to build stone towers strong enough to sustain the chains, and that therefore steel must be resorted to. Now considering that the pull of the chains really comes on the girders of the high-level bridge, which form an immense tension-bar, it is impossible to accept such a conclusion. The simple architectural treatment would have been to treat the high-level bridge as a girder resting on the stone towers, to have brought it through the towers on roller-beds (to allow for any movement from expansion and contraction), and to have attached the chains *visibly* to it on the landward side. We should then have had a construction perfectly simple, and which would have fully explained itself. Instead of that, having decided that the towers must be constructively of steel, it seems to have been resolved nevertheless (perhaps it was felt obligatory), to carry out the original condition that the design was to be such as to harmonise (save the mark!) with the architecture of the Tower. Accordingly the steel piers were cased with stone-work, which outwardly simulates the aspect of a solid stone-tower. The full extent of the make-believe in this is not to be appreciated in the present aspect of the structure. When I went over the work shortly before its completion the construction was nakedly visible to some extent, and the whole height of the side walls of the tower was seen standing on the cross-tie of the steel construction, with empty space under it. I could really hardly believe my eyes when I first saw this. Even in regard to outward appearance, supposing the stone towers were solid constructions, the design has been much deteriorated and weakened in comparison with Sir Horace Jones's by the greater amount of detail crammed into it, and the further weakening of the vertical expression of the stump of the tower by surrounding it with successive bands of decoration dividing it into stages of nearly equal height. The gateway approaches, taken by themselves, are much better than the towers, and are pleasing bits of architectural design, but they are rendered ridiculous by the device of apparently running the great suspension-chains over them, which they are to appear to support, although we know that the action of these chains, if so supported, would rake the stone-work to pieces in a short time. The whole thing, as far as architectural expression is concerned, is the most colossal piece of architectural gimcrack that has ever been seen. Though I would have much preferred the solid stone towers intended by Sir Horace Jones, it would have been far better to have shown a naked steel structure than to have perpetrated this extraordinary piece of sham architecture, in which what appears to be the supporting construction is really the supported. And, in fact, the steel structure would have been, in the true sense, much more in harmony with the Tower than the present structure. It would have shown how civil engineers construct in the nineteenth century, just as the genuine ancient portions of the Tower show how military engineers constructed in the early Mediæval period.

What will be done with the next new bridge we cannot conjecture, for the County Council declined to lend or divulge the design for it for this occasion, though I was given to understand that they might have done so had the design been determined on; but it appears that it is still under consideration. They might, perhaps, have done worse than take the opportunity of getting the opinion of an assembly of architects on the merits of alternative designs.

The summary of the matter is that down to the early part of this century engineers could and did produce bridges which were characterised by grand, simple, and impressive design. They apparently cannot do so now, and the principal reason seems to be that they have abandoned simplicity and are constantly bitten with the idea of producing handsome and showy erections, and bedizening them with so-called architectural detail which they do not know how to design or how to apply, and apparently nothing will induce engineers to believe that any special study is requisite to know how to do so. When a proposal was made some years ago that architects should be called on to design bridges in collaboration with engineers, I remember a letter being published from an engineer saying contemptuously that "engineers were not going to put themselves into architectural harness." Then will they at least have the goodness to let architecture alone? I really think we have some right to lecture the engineers on this point, for if architects have not all the constructional knowledge possessed by engineers, they know the value of such knowledge, and they know where they are deficient; but the engineers are entirely blind to their own deficiencies as to design. The position is pretty well represented by the story of the young dandy of small mental development, who said in a melancholy tone, "Of course I am a d——d fool, and I know it; but my brother Tom is a d——der fool than I am, and he doesn't know it." In France it is the universal custom, when a statue is to be set up to some eminent man, that an architect is associated with the sculptor to design the pedestal or other architectural surroundings. It would surely be as reasonable that in bridge building an architect should be associated with the engineer to design the portion above water, or at least to supervise the decorative details. But if we are met, as I know we should be by many, with the sneer that we "want a share in the job," I should reply that we are quite content to leave it all in their hands, if they will take such engineers as Rennie for their model, and be content to build simple bridges instead of attempting handsome ones.

[The author of the foregoing paper wishes to express his thanks to Mr. Wonnacott and other members of the "A.A. Camera Club," who undertook the photographing of the views of old bridges, now removed, which are preserved in the Crace Collection; and also to Mr. Drummond-Milliken, who kindly saved him a good deal of labour by looking up for him the dates of erection and names of the builders of the various bridges mentioned.

The President, in inviting discussion, said that the paper they had listened to was a very enjoyable one. It might be known to most of them that the Institute had been taking a considerable interest in the design of the new bridge, and possibly Mr. Caröe, who represented the committee, would say something on the subject.

Mr. W. D. Caröe was afraid he could not give much information upon the point the President had raised, and he would first propose a hearty vote of thanks to Mr. Statham for giving them what might be termed a "record-breaking" paper. He was reminded that many years ago, before he came to London, he was taken, quite by chance, to hear a very interesting lecture upon the subject of ornament. One of the points of that lecture was as to the ornament upon the piers of modern Blackfriars Bridge, and the author of the lecture was Mr. Statham, who said some pungent things. That was, perhaps, the first time that he (the speaker) began to take an interest in bridges, and he felt therefore he could offer Mr. Statham his hearty thanks for the architectural suggestions which he then made, and which had clung to him ever since. The present paper was opportune in two ways; first, because it was such an admirable illustration of the papers read on the previous Monday, upon "The Value of Simplicity in Architecture." Secondly, because London was going to have a new bridge, or rather two bridges, viz., one at Vauxhall and one at Lambeth. He was glad to hear Mr. Statham describe the present bridge at Vauxhall in such favourable terms. The parapet seemed to be a most admirable illustration of how simple lines, simply treated, could be made into a most artistic whole. If the new bridge was to be built of iron, and they could persuade the County Council to adopt some construction which would be suitable to the re-use of the parapet, they would be going a long way towards getting better iron construction. He drew attention to the practical and possibly architectural value of shelters on the piers. He had seen one of the designs for the new bridge, and he must say that they were greatly indebted to the County Council for the courteous way in which they had met the representations made to them by the Institute upon this point. He heartily agreed with what Mr. Statham had said about the importance of securing stone bridges for London. This matter had been strongly represented to the County Council, but he was sorry to say that steel and stone piers seemed to rule, for cheapness sake. It cost, he believed, between 100,000*l.* and 200,000*l.* less to make a bridge of steel with granite piers, than one constructed altogether of granite, while Portland stone was not in favour in connexion

with granite, though he could not see why. That being the case, they should consider the best way of constructiug a steel bridge with stone piers in some manner which would be architectural. There was no doubt it was possible to get a fairly good effect in that way, if the steel was simply treated in a straightforward manner as steel. He greatly admired an iron suspension-bridge when well constructed, and as an instance he would refer to that at Budapest, designed by an Englishman, who also designed a very poor bridge at Shoreham. One element of difficulty lay in the changing water-level. In Paris, except at flood-time, the Seine remained at the same level, and, therefore, the proportions of the bridges were always the same. In London, however, there was a difference of from 10 ft. to 15 ft. between high and low water, so that sometimes a bridge had no legs or feet at all, the arches springing right out of the water, while at another time it had long legs, and the proportions were entirely changed. That was a point which Rennie took into consideration. He believed it would be found that the proportions of Waterloo Bridge were best when the tide was about two-thirds down, that being about the period when it was longest seen. At very high tide, the lower parts of the piers and the orders were entirely covered, and then the proportions were not good, but perfection could not be attained at all times. Now, that was a point not taken into consideration in the more modern bridges, but whether the bridge was of iron or stone it was a most important matter. Another point of interest was the buttressing of a bridge upon the reverse side to the current. Old Stirling Bridge was one of the most charming structures of the kind. It was rather narrow for its length, consisting as it did of three arches, which showed that the builders of those days were able to construct a large elliptical arch. In such a case, buttresses on both sides would be allowable, because they supported the narrow bridge. Stirling Bridge, too, was remarkable for solid masonry construction, the architect adopting the admirable principle of not laying a stone except upon a level bed. He joined Mr. Statham in his admiration of Kew Bridge, and the Institute had already made representations to the local authorities to the effect that Kew Bridge, as well as Richmond Bridge, should be preserved. To mention the Tower Bridge to him was like holding up a red rag to a bull. In fact, he considered it the most poisonous piece of architecture they had ever had, because everybody seemed to think it so beautiful, and the Press also represented it as such. One could imagine the fine old Norman keep, and the magnificent archway of the water-gate of the Tower, smiling derision at such an example of nineteenth century progress.

Mr. Halsey Ricardo was very much struck with the distressing story in Mr. Statham's paper, how in the matter of beauty they seemed to be going from bad to worse in the design of bridges. Perhaps much was due to the conditions of the present day in regard to these. A bridge now-a-days had to be constructed to meet the haste of impatient people, who would not go up-hill to climb over it, and who refused to have small arches, because they impeded the traffic on the river. If, then, there must be such immense spans and levels, such sizes did away with one of the accustomed notions of beauty. Waterloo Bridge, no doubt, was a fine affair in itself, but it was simply crushing to Somerset House and other buildings in its vicinity.

Mr. Geo. H. Fellowes Prynne said the subject of Mr. Statham's excellent paper was one of great public interest, and he was glad that the new Tower Bridge had rightly received severe criticism. But in this bridge he felt there was something just good enough to make one wish it was better, and something just bad enough to make one wish it was not there at all. To see the Tower Bridge at its best it should be visited in a fog; the general massing was then seen without being spoilt by the poor and weak detail. A great opportunity had no doubt been lost of making a bridge worthy of the entrance to such a city as London. It was a shame, in fact, that the genius, which he hoped was still existent amongst English architects, had not been more generously consulted in connexion with this bridge. He had much pleasure in seconding the vote of thanks.

Mr. B. F. Fletcher believed that Mr. Statham meant to convey not exactly that iron was bad, but that, in many respects, it was not quite so monumental as stone. That, of course, brought in the great question of modern economics. Those who had seen some of the bridges in America, such as the great Brooklyn Bridge, and the cantilever and suspension bridges at Niagara, must admit that although, as Mr. Ricardo had said, they felt necessarily the loss of scale, yet there was a certain amount of grandeur from this treatment of a new material, which, though not quite appreciated now, would be so in a good many years' time. The great span of Brooklyn Bridge was really a grand and impressive sight. The mistake, in the case of the Tower Bridge, seemed to have been caused by the divorce of architecture and engineering.

Mr. S. B. Beale thought that a perusal of Mr. Statham's paper would give an intelligent engineer sufficient knowledge to enable him to avoid the terrible things they saw perpetrated at the present day. On the other hand, an architect would have to devote a very considerable amount of time to learning even the rudiments which would enable him to attempt anything in the way of engineering, and particularly in the matter of iron bridges. He supposed there was little doubt that the conformation of the river's bed had altered since the span of the arches had been widened, and it had been stated, with authority, that the lack of water in the upper reaches of the Thames was largely due to the alterations in the spans of the arches of recent bridges. As architects, they were largely interested in bridges, and he was therefore pleased that Mr. Statham had opened up the question, and he believed that engineers would largely benefit by the remarks that had been put before them. The paper was an important one, because it dealt with structures which undoubtedly, more than any other, made or marred the beauty of a great city.

The President considered that a debt of gratitude was owed to Mr. Statham for having given up so much of his scanty leisure to preparing such an admirable paper. He should like to emphasise what Mr. Caröe had said as to the very courteous manner in which the Art Committee of the Institute had been received by the County Council. Indeed, they appeared to be glad to find that architects took sufficient interest in the bridges of London to send a deputation. Unfortunately, when they came to the question of having a bridge of stone, instead of one of stone and steel, the question of cost seemed to be prohibitive. He suggested that Portland stone might be substituted for granite, but was informed that the difference in cost was quite trifling. It had occurred to him since that there was no reason why, if the piers and arches were made of granite, the rest of the bridge should not be constructed of red brick. The piers of Charing Cross Railway Bridge were built of red brick, and both stood and looked well. That would meet Mr. Statham's point that engineers' iron bridges, on good solid brick or stone foundations, did not look bad. After all, the whole trouble with the engineers was that they would try to be architectural, while, if they would only stick to their simply constructional iron or brick and stone, nobody could say a word against them. The chief feeling the paper had left upon his mind was that all the beautiful bridges had gone or were going. The view they had seen that evening, of old Hammersmith Bridge, seemed to show that it was the finest suspension bridge they had had near London, while those existing at the present moment were all more or less dreadful. As to the Tower Bridge, he did not think it was really so bad as it was made out to be. If the windows in the towers were filled up solid with stone, and the crowded turrets, gables and finials, were removed, it would not be a bad bridge. He had seen it under a great many conditions, and if the detail could be obliterated, the outline of the bridge was not unpleasing. It would be well, therefore, if the Art Committee of the Institute could approach the Corporation, and suggest that a few thousand pounds should be spent in taking down these things and filling up the windows.

The vote of thanks was then put, and heartily received.

Mr. Statham, in replying, said that a suspension-bridge, owing to its lines, could not be other than beautiful, if let alone. Mr. Caröe had referred to Stirling Bridge, and in such a case buttresses on both sides might be required. At the same time, the up-stream buttress should be of a different shape to the down-stream one; the conditions were different. A reference had been made to Waterloo Bridge as destroying the scale of Somerset House, but if they got bridges on a grand scale, they must endeavour to make the surrounding buildings correspond. As to iron, he was not a fanatic against it; in fact, he had a great admiration for the Forth Bridge. He did not want, however, to see iron treated "ornamentally," or put in where stone would do quite as well. With regard to expense, it should be borne in mind that a granite bridge would probably last three times as long as an iron one. He had asked Sir Benjamin Baker how long the Forth Bridge would last, and the reply was that, with proper care, it might last five centuries. He would ask, how long had the Pantheon lasted, without much care? As to filling up the openings in the Tower Bridge, no doubt that would improve it in outward appearance, but they would still have the poisonous knowledge of the sham construction remaining.

The proceedings then terminated.

ARCHITECTURAL ASSOCIATION, DISCUSSION SECTION.—A combined meeting of this Section of the Association and the A.A. Camera Club was held at 56, Great Marlborough-street on the 20th inst. The subject of the discussion was the relative merits of the Sketch-book and Camera as Aids to Architectural Study, and proceedings were opened by the reading of brief papers by Mr. Francis R. Taylor and Mr. Matt. Garbutt, A.R.I.B.A. The papers were illustrated by lantern slides by members of the Camera Club, sketches by Mr. Garbutt, and photographs. Messrs. Wonnacott, Allport, Vernon, Lewis, Henderson, Sheridan, and the Special Visitors, Messrs. Fleetwood and Hooper, joined in the discussion.

THE LONDON COUNTY COUNCIL.

THE usual weekly meeting of the London County Council was held on Tuesday, at the County Hall, Spring Gardens, Sir John Hutton, Chairman, presiding.

The Water Question.—The debate on the report of the Water Committee was resumed. The recommendations of the Committee were:—

"1. That the Council is of opinion that the scheme for a system of storage reservoirs, presented to the Royal Commission on Water Supply by the water companies, coupled with the proposal to abstract large additional quantities of water from the rivers, is not the proper method of meeting the future wants of London. 2. That any further capital expenditure on works in the Thames and Lee valleys for the supply of London should be regarded as of a temporary character, and should be restricted to such improvements as may be for the time indispensable. 3. That the true solution of the problem is the obtaining of the necessary additional supplies from a purer source; and that accordingly the Water Committee be instructed to proceed with the preparation of a scheme to be presented for the consideration of the Council as soon as possible, with a view to an application to Parliament for the necessary powers."

Mr. Beachcroft moved the following amendment on paragraph 1:—

"That the following words be added, 'but that in view of the facts disclosed by the report of the Water Committee, which lead to the conclusion that the acquisition by the Council of the water companies' undertakings may involve the Council in an outlay of over fifty millions, it is essential, before the Council is asked to commit itself further, that the financial aspect of the whole question should be considered; and accordingly that it be an instruction to the Finance Committee to report on the estimated effect of the acquisition of the undertakings of the water companies on the county rate, having regard to the recent report of the chief engineer and to the terms of the scheme for the creation of new stock approved by the Council on the recommendation of the Finance Committee in July last."

He said that it was desirable there should be some kind of authority over the water-supply. Sir W. Harcourt offered three alternatives. One was regulation, the other independent supply, and the third was purchase. Mr. Bassett Hopkins and the majority of the Council had practically resolved that the only way in which the object could be attained was by the acquisition of the water companies. He proposed to mould into one the last two alternatives of Sir William Harcourt. Having regard to the report of the Water Commission, the Moderate party did not yet consider that the Thames was insufficient to supply the water for London. As to his statement in his amendment that 50,000,000*l.* would be required, he took it that 30,000,000*l.* at least would have to be found for the acquisition of the water companies; 18,000,000*l.* would be required for a supplementary supply, and 2,000,000*l.* would be required for temporary works which the committee admitted would be required.

Sir George Harris seconded the amendment.

The vice-Chairman, Mr. Charles Harrison, said that in the large provincial towns they found millions of money invested in the water-supply, returning a good dividend to the reduction of the

rates, and if that could be done in other large towns, why could it not be done in London? What was good enough for forty-three municipalities outside London should be good enough for London.

Sir John Lubbock said he was heartily in sympathy with the report of the Committee, as they were all agreed that before long they must look for some additional water supply. The Royal Commission had only reported on one mode of supply, and therefore its opinion was not of the value it would otherwise have been. He thought they must look away from the Thames for a future supply, and whether a supply obtained elsewhere would be cheaper or not it would undoubtedly be purer, and that was the great point. The areas from which they could obtain a supply were getting fewer, and they must take care to secure water rights where possible as soon as they could. But although he was in favour of the report, he did not see anything antagonistic in the amendment to it. The question of a remunerative investment depended on what they paid for it, and he confessed he thought they would be making a mistake if they attempted to buy up the water companies at present.

Lord Farrer opposed the amendment, as he thought they should pass the resolution to show that they did not consider the report of the Royal Commission conclusive.

After further discussion, the amendment, on a show of hands, was lost, and on a division the voting was: for the amendment, 19; against, 62.

The recommendations of the Committee were then agreed to.

The Council adjourned shortly before 7 o'clock.

COMPETITIONS.

PUBLIC OFFICES, SUTTON, SURREY.—The competition for public offices, fire-station, Technical Institute, and swimming-baths, at Sutton, Surrey, has just been decided as follows:—First premiated design, Messrs. Curry & Tatlock, Sutton; second, Mr. H. T. Hare, York-buildings, Adelphi, W.C.

ENGINEERING SOCIETIES.

CIVIL AND MECHANICAL ENGINEERS' SOCIETY.—At the last meeting of this society, Mr. E. H. G. Brewster, A.M.I.C.E., read a paper on "Water Waste-Preventer Cisterns." He first drew the attention of the meeting to the necessity for these, and illustrated this by giving particulars of the quantity of water that would run to waste through small holes, *e.g.*, a hole only one-sixteenth of an inch in diameter in a pipe having a pressure of not more than 45 lbs. per square inch would result in a loss of 648 gallons in a day. Attention was then drawn to the waste-preventer cisterns of J. Ashley and T. Binns, patented in 1792 and 1793, or more than a hundred years ago. Waste-preventer taps were incidentally touched upon. The modern types of water waste-preventer cisterns were divided into four classes. 1. Tip-up apparatus; 2. Cisterns with inlet and outlet valves only; 3. Cisterns divided into compartments and having more than two valves; 4. Cisterns worked in conjunction with syphons. The latter class was stated to be the one most commonly used at the present time. The "Tower" cistern was particularly alluded to as being one of the simplest and the foremost of the valveless type now very general. The "Paisley" was also described, as were many others.

THE INSTITUTION OF CIVIL ENGINEERS.—At the ordinary meeting of this Institution, on the 19th inst., Sir Douglas Fox, Vice-President, in the chair, a paper was read descriptive of "Plant for the Extraction of Gold by the Cyanide Process," by Messrs. Charles Butters and Edgar Smart, A.M.Inst.C.E.

SURVEYORSHIPS.

KETTERING.—Out of ninety-seven applicants for the office of Chief Assistant Engineer and Surveyor to the Urban District Council of Kettering, Mr. Ernest H. Essex, of Nottingham, has been selected.

MEMORIAL-TABLET, ST. MARGARET'S CHURCH, AIRDRIE, LANARKSHIRE.—On the 17th inst. the ceremony of unveiling a memorial-tablet to the memory of the late Rev. James Canon M'Intosh, took place in St. Margaret's Church, Airdrie. The tablet was designed by Messrs. Pugin & Pugin, London.

Correspondence.

To the Editor of THE BUILDER.

DURHAM CATHEDRAL.

SIR,—The discovery of certain fragments of the original eastern termination of the Norman Cathedral of Durham has already been noticed in your columns. The *Times* of February 16 contains a letter from Mr. C. Hodgson Fowler, F.S.A., the cathedral architect, describing in detail what has been found. He considers it difficult to account for the foundations of the aisle apses, and suggests that they are part of the foundations of Aldhun's church, probably of the apsidal chapels opening out of the transepts.

I venture to think that such a theory will be found to be quite untenable. It involves the supposition that Carilef's designer set out the plan of his entirely new building in 1093 in such a manner that his south choir aisle was exactly central with one of the transeptal apses of Aldhun's church, while his north choir aisle only deviated 6 in. from the centre of the other transeptal apse; or, in other words, that he must have allowed the retention of two inconsiderable fragments of the earlier church to control the elementary width he fixed for his new building.

The foundations which have been discovered clearly indicate that the choir aisles terminated in apses internally, and were finished square externally. The thickness of the foundation wall in the centre of the northern apse (east and west) is nearly 13 ft. It is quite clear, however, that the foundation of the aisle wall was made sufficiently wide to receive not only the wall itself, but the buttresses and their plinths on the outside, and the vaulting-shafts and their bases on the inside. A part of this foundation is still to be seen on the outside of the north aisle, next the Nine Altars, and is shown on Mr. Hodges' plan in your Cathedral series. The foundation of the aisle-wall must, therefore, be between 11 and 12 ft. in thickness, and the difference between this and the thickness in the centre of the apse is not great for foundation work.

The eastern termination of Carilef's church, as revealed by these excavations, consisted, then, of a great apse to the choir itself, and small apses to the aisles, the latter finishing square externally. Such a plan was not uncommon in the larger Norman churches of the half-century following the Conquest. It was adopted at St. Albans (see Buckler's plan) and at Peterborough. The latter is an interesting parallel to Durham, and is very similar in plan, though it shows considerable advance in the method of setting out the apse. In Normandy the same plan is found in the churches of Lessay, St. Nicholas, Caen, St. Georges-de-Boscherville, and St. Gabriel, all illustrated in Ruprich-Roberts' "L'Architecture Normande." Romsey, quoted by Mr. Robson, has the same form of termination to the aisles only.

JOHN BILSON.

Hull, February 19, 1895.

"PROFESSIONAL ADVERTISING."

SIR,—My attention has been called to a letter in your last issue signed "A.R.I.B.A." The explanation of the facts commented on is very simple. Not only was the notice-board in question *not* put up by me or at my instigation, but absolutely without my knowledge or consent, and I did not know of its existence until your correspondent's letter appeared.

JOHN SLATER.

*** Had Mr. Slater's name been mentioned, we should have known that there could be no explanation but that given by him; and our correspondent showed great want of knowledge of the world in imagining that any man in Mr. Slater's social (to say nothing of professional) position would have put up his own name with "Esq., B.A." after it, which it appears was the "style" of the notice-board referred to. But there are other such boards about in which we suspect the advertising of the architect's name is not done without his concurrence. —ED.

EFFECTS OF EARTHQUAKE ON BUILDINGS IN JAPAN.

SIR,—Among the Notes in your issue of August 25 last, is one quoting from a letter sent by Messrs. Ende & Boeckmann, architects, of Berlin, to the *Deutsche Bauzeitung*.

The statements made in that letter are entirely misleading, and I am writing to your German contemporary to contradict them; may I, at the same time, ask you to be kind enough to give publicity in your esteemed journal to a similar explanation?

Messrs. Ende & Boeckmann, referring to the severe shock of earthquake experienced in Tokyo on June 20 of this year, state, presumably upon an incorrect report furnished to them, that, whereas all other brick buildings suffered severe damage, the blocks erected from their designs withstood the movement without showing a crack. In the same context they assert that thirty-two buildings collapsed, eighty-one were razed to the ground, and 4,551 were damaged, adding that though the majority of these were of native construction, the latter withstood the shock far better than the average European structure. These statements all tend to convey the impression that the two buildings erected by Messrs. Ende & Boeckmann were the only brick and stone erections uninjured by the earthquake, and that most, if not all, of the others were seriously damaged. The architects named also take credit to themselves for the originality of certain constructive precautions which they claim brought about such satisfactory results.

Before controverting these implications let me premise by stating that the modern art and science of building was introduced into this country some thirty years ago, from which time foreign architects and engineers of several nationalities and Japanese experts, as education and experience prepared them, have erected numerous solid buildings in the capital, and other large towns, for governmental, educational, commercial, and manufacturing purposes. In these works earthquake considerations have always to some extent exercised a precautionary effect. Buildings have never been made of any great height, and heavy cornices and overhanging constructions, so common in the West, have been avoided. A French architect some seventeen years ago introduced a system of iron network built in brick walls which was applied to several buildings. It was not, however, until a shock of more than usual severity occurred in some of the southern provinces, in October, 1891, that an opportunity was given to local architects to study the effects of a really violent oscillation upon certain modern structures as compared with those in the ancient style. Unfortunately most of the brick buildings existing within the radius of severest commotion were of the provincial and manufacturing class, possessing serious defects from the point of view of merely ordinary secure construction. Osaka, a large town sufficiently near the centre of disturbance to be most seriously shaken, contained, however, certain brick and stone buildings solidly erected under competent supervision, which gave a very good record, contrasting favourably with the effects upon brick buildings of a speculative class in the same locality.

Precautions in all new buildings erected in Tokyo were henceforth redoubled, particular attention being paid to the quality and adhesion of the mortar; the thickness, bond, and continuity of the walls; the suppression of heavy gables, chimney-stacks, and unflanked masonry; and other points on which the Japanese architects (who by this time chiefly controlled the building operations of the country) were mutually agreed. The result has been that in the severe earthquake of Tokyo on June 20 of this year, which is the subject of Messrs. Ende & Boeckmann's letter, all of the more recently-erected brick buildings, and a considerable number of the better class of solid structures erected during the last twenty years, were entirely uninjured. Among numerous structures of equal importance to those of Messrs. Ende & Boeckmann which exhibited no sign whatever of injury from the shock, may be mentioned: the Central Bank of Japan, the 119th National Bank and Mitsu Bishi Offices, the Meiji Insurance Offices, the Tokyo City Hall and Municipal Offices, the General Post Offices, the Agricultural and Commercial Department, the Department of Communications, the New Admiralty Offices, and the principal blocks of the Imperial University. These are all large and prominent buildings, some of them three stories in height. Many other important buildings might be mentioned in which the chimney-stacks alone were damaged, and which would not have suffered had heating apparatuses been employed (as in the Departmental offices), or had iron stacks (as now everywhere adopted) been introduced. The official residences, most of the foreign Legations, and certain well-built private houses, come under this head. A few brick buildings were so fissured as to require their being afterwards condemned, but none suffered collapse at the time of the earthquake, as erroneously stated; and for the most part a few repairs to the chimneys, parapets, gables, and upper arches have rendered damaged buildings safe and habitable. A large mercantile district in Tokyo, known as the Ginza, has for twenty years been covered with continuous blocks of brick buildings, consisting of some hundreds of houses and shops, and these, though of the most simple and unpretentious character, escaped with only slight injury in places.

Messrs. Ende & Boeckmann's visits to Japan in 1886 and 1887 resulted in the preparation of designs for certain Governmental offices for Tokyo, and the commencement of two blocks—the New Law Courts and the Ministry of Justice—under their general direction from Berlin, with the aid of five assistant German architects and several Japanese architects on the spot. These two buildings, together with a temporary wooden structure for the Imperial Diet, unfortunately consumed by fire immediately after completion, are the only buildings carried out from Messrs. Ende & Boeckmann's designs, and neither

they nor their assistant compatriots carried them to completion. They will still take another year to finish, and have for the past year and a half been entirely under the direction of Japanese architects. Projects and general drawings were prepared by the Berlin firm of architects for a permanent Imperial Diet (illustrated in your journal of October 13), for the new Admiralty and the Central Police Office, but these have been made no further use of. The new Admiralty Offices are just completed from totally different plans and designs, and the Permanent Imperial Diet and Central Police Office are abandoned.

It would, indeed, have been strange and unfortunate if the two blocks partially carried out by Messrs. Ende & Boeckmann, at such cost and with such unexampled local assistance, had fared worse in the violent earthquake of June 20 than other contemporary erections of like character; and I and my colleagues are desirous of giving all credit that is due in endorsing the statement that these two buildings suffered to no appreciable extent during the shock. But that, in this respect, they were isolated exceptions to other buildings of their class, or even to buildings of a less costly character. I respectfully beg, most distinctly, to assert that Messrs. Ende & Boeckmann have been most seriously misinformed in the matter.

TATSUZO SONE, Architect.

Tokyo, Japan. Dec. 18, 1894.

CANTERBURY SURVEYORSHIP.

SIR,—In your last issue there appeared an advertisement in reference to the above appointment, and, among other particulars, it is stated that the salary of 350*l.* per annum is inclusive of office rent and clerks.

This appears to be a most unreasonable arrangement, for it is impossible for a stranger to know at what amount these expenses should be assessed. Surely it would be far more equitable for the Corporation to follow the usual course and pay these expenses direct, and fix the salary of the Surveyor at a nett amount.

Another point to which I should like to draw attention is the extraordinary condition that applications must be accompanied by twenty-five printed copies of testimonials. This is wholly unjustifiable; why should applicants be taxed to the extent of, say, at least a guinea each for the doubtful privilege of competing for this appointment? It would be bad enough if the selected candidates only were asked to send in these printed testimonials, but even then it would seem more just for a wealthy Corporation to incur the expense instead of throwing the cost upon the competitors, especially as it is for the convenience of the members of the Council that these printed copies of testimonials are required. In the course of a year it would be a serious item to those who compete in many of the appointments advertised if such conditions were generally imposed.

The idea of the assistants being paid by the surveyor out of his salary is a very bad precedent, and would seem to put a premium on "sweating." Even as it is, the younger members of the profession are sufficiently ill-paid, especially considering the proportionate work done by them, as I can vouch, from personal experience, that in many cases the assistants do all the real work, while the chief gets the whole of the credit and the lion's share of the pay. I therefore beg to enter my strongest protest against such a retrograde innovation. Doubtless a large number of really eligible surveyors will be deterred from competing by these two conditions.

"AN ASSISTANT BOROUGH SURVEYOR."

OBITUARY.

MR. T. E. BRIDGEN.—We regret to have to record the death of Mr. Bridgen, of Manchester, late of the firm of Pennington & Bridgen. His death occurred on the 15th inst., at the age of sixty-two. He was a pupil of Cottingham, and was in practice in Manchester and London for thirty-five years. His firm were architects for a great number of hospitals, including the remodelling of Manchester Royal Infirmary, Royal Eye Hospital, Children's Hospital, Pendlebury, and many others in Manchester. The large Convalescent Fever Hospital at Winchmore Hill, for the Asylums Board, and the North-Western Hospital at Hampstead, for the same Board, were also carried out by his firm, which since early last year he has ceased to be a member of, the practice being since carried on under the style of Pennington & Son.

GENERAL BUILDING NEWS.

THE ROYAL UNITED SERVICE INSTITUTION, WHITEHALL.—The new building, which adjoins the Banqueting Hall, Whitehall, and which, in conjunction with that historic edifice, will be the future home of the Royal United Service Institution, was opened on the 20th inst. by the Prince of Wales The architects were Messrs. Aston Webb and Ingress Bell. A description of the building was given in our issue of the 2nd inst., page 77, and illustrations have appeared under date May 13 and September 16, 1893.

WESLEYAN CHAPEL, SWINTON, YORKSHIRE.—The memorial stones of a new Wesleyan Chapel were laid at Swinton, near Malton, on the 7th inst. Mr. Edward Taylor, of Stonegate, York, is the architect, and the contract for the work has been let in two divisions—builders' and plasterers' work to Mr. Henry Oldfield, of Malton; joiners, slaters, plumbers, glaziers, smiths, and painters' work, to Mr. George Mansfield, York. The building will consist of the chapel proper, with accommodation for 200 sittings, and east transept for organ and choir. On the west side will be a school-room separated from the chapel by shutters, and giving accommodation for 100 children. On the north end of the building will be three vestries, all communicating with the chapel and with each other.

EXTENSION OF ROYAL INFIRMARY, ABERDEEN.—Offers have been accepted from local tradesmen for the erection of a new medical block at the Aberdeen Royal Infirmary. The building will be a three-story one, containing six wards for general medical cases, and two small wards for erysipelas cases. Accommodation will be provided for ninety-four beds in all, the beds in the erysipelas wards numbering eight. The total of the accepted offers is 12,365*l.*; and adding the cost of introducing electric light, of painting, architect's fees, and furnishings, the entire expenditure will be 17,000*l.* This block completes the Jubilee extension scheme. Messrs. Smith & Kelly, Aberdeen, are the architects.

RESTORATION OF TOWER, ST. MARY'S CHURCH, BRECON.—The tower of this church will shortly be re-opened, after having undergone restoration under the superintendence of Mr. F. R. Kempson, of Birchyfield, Herefordshire. Care has been taken to preserve the old work, and where it was found absolutely necessary to insert new work, precaution was taken to ensure that it corresponded to the old work. The bells have been taken down, repaired, and re-hung, including new bell-framing by Messrs. Taylor & Son, of Loughborough. Messrs. Collins & Godfrey, of Tewkesbury, were the contractors.

NORTH BRITISH STATION HOTEL, EDINBURGH.—The designs of Mr. W. Hamilton Beattie of the hotel which the directors of the North British Railway have resolved to erect on the site between the North Bridge and the Waverley Market, show a building which, when completed, will cost a sum of 221,000*l.* The style is a free treatment of Renaissance. The main elevation is to Princes-street. Here the frontage is of nearly 200 ft., rising six stories from the street level to a height of over 100 ft. at the crown of the roof. One of the features of this elevation is the great tower occupying the centre of the façade, and rising to a height of 160 ft. above the street. The other salient features are the angle pavilions which, ending in cupolas at the roof level, flank the tower at each corner of the building. The massiveness of the tower above the roof level is further relieved by ornamental clock faces. The building has a central court 70 ft. square. The principal public rooms of the hotel occupy the west and north fronts on the level of Princes-street. Public restaurants and bars occupy the north-east corner. The North Bridge front at the ground level is to be chiefly taken up with shops, and the south front is to be occupied by the railway offices. The topmost stories of the entire block will form part of the hotel bed-room accommodation. The main entrance is under the central tower in Princes-street. The entrance hall, 52 ft. by 26 ft. by 22 ft. high, gives access on the west to the grand staircase hall, which is 46 ft. by 30 ft. Both are designed with pillars, arcading, and galleries; and the double staircase itself, of white marble, with open arcading dividing it from the hall, and with stained-glass windows, is one of the features of the interior. As a prolongation of the entrance hall, carried across the central court is a reception-hall, 58 ft. by 20 ft. and 20 ft. high. The principal dining-room occupies the centre of the west front. It is 78 ft. long and 28 ft. wide. Fronting Princes-street, immediately to the west of the entrance-hall, will be a room 39 ft. by 27, designed for public meetings and dinners.

PROPOSED RESTORATION OF PERTH MUNICIPAL BUILDINGS.—The question of the restoration of Perth Municipal Buildings, which were partially destroyed by fire a month ago, has been considered by the Town Council. Their proposal is to retain the site, and it has been resolved to remit to Mr. Heiton Grainger, architect, to draw up designs for the new building.

SANITARY AND ENGINEERING NEWS.

TRURO DRAINAGE.—Mr. Baldwin Latham has reported on four schemes submitted in competition for the sewerage of Truro, entitled "A 1," "Cornubia," "Fide et Spe," and "Sanitas." The present system admits rain and stream water to the sewers, but as arrangements will be made for intercepting the water which now meanders through the streets, so as ultimately to convey it to its natural outlet in the river, Mr. Latham considers that the provision to be made in the sewers would be for rain falling and flowing off the surfaces of the city. "Sanitas" proposes to intercept a certain proportion of the rainfall from the city sewers, but Mr. Latham says the amount proposed to be expended in this way could only deal with a very small portion of the total rainfall, and it is hardly worth while to disturb the streets to put in new sewers for this purpose. He expresses decided preference for the scheme of "A 1," which combines the distinctive features essential to be carried out in a district like Truro. Mr. Latham places "Fide et Spe" second, "Cornubia" third, and "Sanitas" last. But although placing "A 1" first, he points out certain faults in that scheme. The sewers proposed to be laid will not effectually pick up and deal with the whole of the sewage of the city, and other sewers would require to be constructed in order to deal with the sewage of many houses abutting on the river. There is not sufficient tidal storage for rainfall, if flooding the district is entirely to be avoided. The sewers are too small to convey the storm water without flooding to the point of outfall of such times as a high tide and heavy rain may simultaneously occur. The sewers in places are not deep enough to drain certain portions of the district. An important point is that the main discharge of effluent water would always take place upon the ebb tide, in view of the liability of impure water being brought to the city. Nearly all the schemes in order to deal with every house in the city will require some modification and addition which will increase their cost.

STAINED GLASS AND DECORATION.

WINDOWS, PARISH CHURCH, BURGESS HILL, SUSSEX.—The parish church of Burgess Hill, Sussex, has just received six more stained glass windows, five being given by Mr. F. Crunden, of Oak Hall, and one by the Rev. J. L. Shallis, the vicar. The work has been entrusted to Messrs. Mayer & Co., of Munich and London.

WINDOWS, ALL SAINTS' CHURCH, PLYMOUTH.—Four large single lights in the apse of this church have been filled with stained glass by Percy Bacon & Bros., of London. The saints depicted were St. Augustine of Hippo, St. Peter, St. Andrew, and St. Thomas of Canterbury. Seven other windows were lately inserted by the same artists in this church.

FOREIGN AND COLONIAL.

FRANCE.—The Chamber of Deputies has put at the disposal of M. Picard, Commissioner-General of the Exhibition of 1900, a credit of 200,000 fr. towards the preparations for the Exhibition. M. Picard had only asked for half the sum. The following architects, MM. Hénard, Sortais, Tronchet, and Varcollier, who all obtained premiums in the competition, have been commissioned to assist M. Bouvard in drawing out the definite plan of the whole.——An immense scaffold has been raised against the Arc de l'Etoile for carrying out important repairs to the structure, especially the cornice, which is in a dangerous state. Fortunately, the sculptures of Rude and Etex are in good preservation.—— The "Sociéré des Artistes Lithographes Francais" is arranging for an international exhibition of lithography to be opened next May in the Galerie Rapp.——The municipality of Paris is about to found a school of drawing in the VIIIth Arrondissement with the funds supplied by a legacy left for that purpose.——The arrangement of the "Salle des Antiquités Africaines" at the Louvre is nearly completed, and it will be opened shortly.——The Municipal Council of Paris has decided on the erection of a monument in the Montparnasse Cemetery in honour of artisans who have died while in their employ, in imitation, to some extent, of the existing monument to deceased firemen. M. Dupré (architect), is commissioned to design the monument, which will consist of a stone pyramid surmounted by a figure symbolising "le Travail." The cost will be about 300,000 francs.——A new hospital is to be built at Saint-Etienne, at a cost of 2,600,000 francs.——The works for a new railway from Albertville to Annecy are to be commenced shortly.——The monument to the "Burgesses of Calais" is to be inaugurated on June 3. The group, by M. Rodin, will stand on a flight of steps, decorated with a figure of a child writing on the tablets of History.——The Budget Committee of the Chamber of Deputies has voted a new credit of 190,000 francs for continuing the excavations at Delphi.——M. Charles Felix Saint-Père, architect, member of the Société Centrale, has just died at Paris, at the age of ninety. He was at first a pupil in the School of Architecture at Dijon, and completed his studies at the Ecole Nationale des Beaux-Arts. Among his principal works are the Hôtel Dieu at Rennes, the Halles at Besançon, the "Asile de bon repos" at Vaugirard, the churches of l'Etang Vergy, Nuits St. Georges, and Prouille; schools, institutions, and numerous private houses. His son, M. Eugène Saint-Père, is also a member of the Société Centrale.

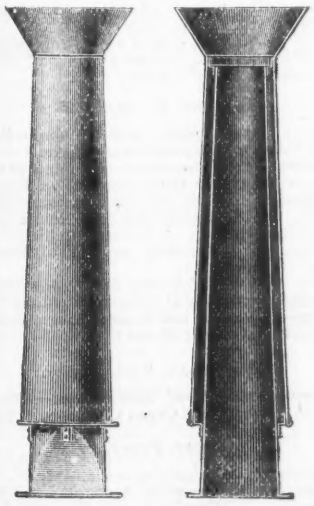
GERMANY.—The municipal sub-committee appointed to consider the projected Suspended Metropolitan Railway (Langen's system) at Berlin, have called in Herr Langen, of Cologne, to assist in the deliberations and furnish a report.——A new station on the Metropolitan Railway (a Government line) is to be opened on the Savigny Platz; the cost, amounting to 12,700*l.*, will be borne by the landowners in the vicinity.——The spread of the electric light in Berlin is strikingly shown by the fact

that there was a decrease in the production of gas during the last quarter of 381,000 cubic mètres.——Two statues of the Margraves Albrecht and Waldemar, by the sculptors Boese and Unger respectively, have been recently unveiled on the Mühlendamm bridge. The cost was 2,500*l.*——The commune of Pankow has petitioned against the Police Ordinance which restricts building operations in that suburb to the erection of residential villas. Several other communes are likely to follow suit.——The German Students' Corps Union will erect a monument to Prince Bismarck on the Rudelsburg. The statue, representing the Prince in his younger days, is to be completed this year.——The Munich "Secession" will hold its Third International Art Exhibition in its Galleries in the Prinz-Regenten-strasse, from 1st June to the end of October this year.——A meeting of the executive committee of the Imperial *Limes* Commission, Herr Zangemeister in the chair, recently took place at Heidelberg, when the programme of this year's operations was drawn up. Last year's work of the Commission, the general report of which has just been published as an appendix to the Year-book of the Archæological Institute, was chiefly directed to the tracing of the boundary mark, originally discovered by Herr Jacobi in the Taunus. This mark, it is now determined, occurs in the case of both the Rhætian and Upper Germanic *Limes:* the form differs locally, the small stones being absent in parts of Bavaria, for instance, although the trench is clearly marked. The trench itself is occasionally wanting where the ground is hard and stony. Remains of a palisade, extending for a length of 15 kilomètres, were discovered on the frontier between Bavaria and Würtemburg, near Gunzenhausen. Eighteen main castella were examined, of which eleven were entirely excavated, in addition to five intermediate castella. For the first time the annual report has to record the loss by death of several of the members of the Commission, namely, Messrs. von Brunn, von Cohausen, and Hölder.

MISCELLANEOUS.

FROZEN WATER-CLOSETS.—The discomforts, not to say dangers, which attend the freezing of water-pipes are alone hard enough to endure; but when the frost is so severe and stays so long with us as to lead to the stoppage of soil-pipes, we are brought face to face with a new evil which demands very prompt and careful action. We learn that in many houses in the suburbs of London this has occurred, and that in many cases the occupiers have been obliged to carry the excreta into the garden or to avail themselves of the premises of an obliging and more fortunate neighbour. When the thaw does set in the consequence of this condition of things may be very serious, and those who are unfortunate enough to be in such an unenviable position should have a stock of some efficient disinfectant at hand. It would be a proper and useful preliminary precaution to place a quantity of disinfecting liquid, such as carbolic acid, in the pan of the frozen closet. The public health authorities might, we suggest, help the people in this matter, so that pestilence and disease may not be counted amongst the contingencies which prolonged frost brings in its train.—*The Lancet.*

THE "DUPLEX" SMOKE CURE.—This is, at all events, an exceedingly simple chimney-top. The theory of it is that the basin-shaped head, the sides of which incline outwards at an angle of some 36 deg. with the vertical, will throw off any current of wind that may strike its inner surface at an angle not exceeding 36 deg. with the horizontal. It has a



"DUPLEX" CHIMNEY-TOP.

twofold shaft, the outer portion of which forms a protecting case for the main shaft, and augments the temperature (and consequently the updraught) of the ascending column of smoke. There seems reason in this, but one can seldom predict very safely what a chimney-top will or will not effect till it has been tried. This is a new idea, and seems worth trial.

CREDENCE TABLE, ST. ANDREW'S CHURCH, GUERNSEY.—An addition to the sanctuary of St. Andrew's Church, Guernsey, has just been made in the form of a carved oak credence table. It is the handiwork of Messrs. Harry Hems & Sons, of Exeter. The table is of fifteenth-century character.

LONDON SCHOOL BOARD CONTRACTS.—At the weekly meeting of the London School Board, held on the 14th inst., at the offices, Victoria Embankment, Lord George Hamilton, M.P., Chairman, presiding, the Rev. J. C. Carlile submitted a motion asking that the Board's Solicitor should prepare a form of contract for buildings and repairs, providing a schedule of wages as mutually agreed upon by the London Building Trades' Federation and the Master Builders' Association; a clause fixing a penalty, not exceeding 25*l.*, in cases of default; and another clause, fixing a similar penalty, in cases of subletting without the written consent of the architect. In asking the Board to agree to this proposal Mr. Carlile said he did not believe it would be possible to ensure the payment of a trade union rate of wages except by the insertion in contracts of a schedule of payments and a clause providing for the imposition of penalties in cases of default. The present system invited a class of contractors who, if they obtained contracts, were sure to scamp the work. Mr. Huggett, on the ground that Mr. Carlile's proposal would limit the number of contractors willing to tender for the Board's work, and consequently increase the cost of building, moved that the question be referred back to the Works Committee for further consideration. He regarded the resolution as an attempt to drive the contractors out of the field, so that the Board might become a body of municipal workers. The rules for tendering were already so stringent that the best contractors in London refused to work for the Board, and he did not hesitate to say that these rules had increased the cost of works to the Board by 20 per cent. General Sim seconded the amendment. Mr. Dumphries was opposed to the Board doing its own work; but did not think any harm would be done by introducing into contracts a schedule of wages with a penalty clause attached. Mr. Gautrey pointed out that the resolution only asked the Board to do what had already been done by Government and by the London County Council. Mr. Lynn supported the motion, on the ground that it would lead to a more liberal interpretation of the relations between masters and men. Mr. Blackmore thought a penalty of 25*l.* would not have the desired effect of preventing breaches of contract, and would only lead to endless litigation, to determine whether or not the terms of a contract had been adhered to. Mr. Benson Clough, Mr. Hamilton, and General Moberly having spoken, a division was taken, when the motion was adopted by 30 against 15 votes.

ART IN DECORATION AND DESIGN.—Mr. C. Voysey, of London, delivered a lecture on the 15th inst. at the City Art Gallery, Mosley-street, Manchester, in connexion with the Manchester and Salford Association of Master Plasterers and Painters, upon art in decoration and design. He urged that the decorator must be free from the bondage of imitation, and that to secure the best results the decorator and designer must express living emotions. With beauty of thought and feeling placed in the forefront of their work, art would be a living power. It was impossible to say how far the decorator and designer could lead the public in that direction. Too often the decorator became a kind of head foreman, and was expected to carry out the desires of those who had no experience in the matter whatever. Under modern conditions the decorator's life was a very hard one. It was partly, however, brought on by himself, in consequence of his readiness to supply anything, to do anything, and to be pulled by the nose, for the sake of the pounds, shillings, and pence to be got out of the public by whom he was employed. Individualism, Mr. Voysey insisted, should be made the foundation of all art. Each man's productions would then be invested with a personal character, and would possess qualities entirely his own; and when that principle was recognised the patrons of art would generously give a fair field to the craftsman, and take a pleasure in placing confidence in his pride and enthusiasm for his work. To arrive at a higher state of art in their work they must modify their spirit of commercialism. The sacrifice must be real, or the reverse, selfish greed, would reign supreme, to the destruction of true and lasting art. They must do their utmost to raise the colour sense from morbid despondency to bright and hopeful cheeriness. Let them have crudity, if they would, rather than mud and mourning. Every attention, again, should be paid to the qualities of simplicity and harmony.

THE MEDIÆVAL MANOR HOUSE.—Mr. F. W. Bedford delivered a lecture before the members of the Thoresby Society, in their room at the Albert Hall, Leeds, on the 12th inst., on "The Mediæval Manor House: Its Architectural History." He remarked that very few manor houses were built during the twelfth century. The Normans built themselves fortresses in different parts of the country, but the land had not been sufficiently sub-divided to call the manors into existence. From what examples we had, however, we found that they were generally built on a universal plan of a large hall with a chamber or chambers adjoining, and this formed the basis on which all manor houses were built up to the end of the fifteenth century. The number of chambers was increased, and other alteration in their disposition took place, but still the large central hall formed the nucleus of the plan. In most examples the hall was on the ground-floor level, and was used by the owner and his followers for both dining and sleeping. Nearly all the examples of the domestic architecture of the thirteenth century were built during the reigns of Henry III. and Edward I. A great many manor houses were built at this time, but they still kept the same general arrangements in plan as in the preceding century. In the fourteenth century a great development took place in domestic architecture. To this period belong the finest domestic and collegiate buildings we have, as the colleges of Oxford, Cambridge, and Winchester; Gainsborough Manor House, Wingfield, and Haddon Hall. The large hall still continued to be the dominant feature in the plan, but it was less used by the owner and his guests. In fifteenth-century manor houses the first thing that struck us was that the hall continued just as before, excepting that in many cases its size had been reduced in proportion to the increase in the number of other rooms—withdrawing-rooms, dining-rooms, and bedrooms. Since the end of the fifteenth century we have made very little alteration in the plans of our country houses. During the Renaissance periods—the sixteenth, seventeenth, and eighteenth centuries—they became more formal in plan, but did not differ materially. Great improvements, of course, have been made since in the practical fittings, sanitary arrangements, heating, and so forth; but a fifteenth-century house was often quite as convenient, as comfortable, and pleasant to live in as a modern house, and generally far more dignified and beautiful.

A NEW CASEMENT WINDOW.—A casement window to open both inwards and outwards has been devised by Messrs. James & Co., of Kentish Town. Its normal use is to open outwards, but the piece forming the inner sill and inner rebate is hinged and secured by a spagnolette bolt fastening at top and bottom, and when required can open inwards, and the window with it. The weak point, of course, is the sill, which is necessarily level, with a ridge or partition running along the centre dividing it into two troughs, to oppose the entry of rain; the inner sill is kept high for the same reason. There is, of course, a channel for the escape of water from the sill. It would be all right in a steady rain, but we rather question its being impervious to a continued driving rain. It is however an ingenious sash, and in situations not too much exposed to wind and rain would no doubt be a great convenience.

THE SANITARY INSTITUTE.—At an examination for Inspectors of Nuisances, held at Bristol on February 15 and 16, the following ten candidates were certified, as regards their sanitary knowledge, competent to discharge the duties of Inspectors of Nuisances:—W. H. Chowins, Bideford; J. Craig, Dowlais; F. Dolamore, Bournemouth; H. Evans, Penarth, Cardiff; S. Flood, Crediton; W. K. Hill, Liverpool; J. E. Jarvis, Plymouth; S. Larard, London; S. G. E. Lee, Torquay; C. W. Stone, Cardiff.

LEGAL.

SOUTHAMPTON COUNTY COURT:

AN ARCHITECT'S CHARGES.

MR. WILLIAM BURROUGH HILL, surveyor, valuer, and estate agent, Above Bar, Southampton, sought to recover from Joseph Kaphan, fried fish merchant, Canal-walk and St. Mary-street, the sum of 22*l.* 2*s.*, made up as follows:—To receiving (in September) instructions, taking measurements and memoranda, preparing plans, elevations, and specifications for rebuilding, and submitting same to the defendant, 20*l.*; to preparing set of tracing and plans, and forwarding same with application to the Urban Sanitary Authority, 2*l.* 2*s.*

Mr. C. Lamport appeared for the plaintiff, and Mr. A. H. Emanuel for the defendant.

It was stated by Mr. Lamport that the amount claimed consisted of the usual architect's charges for work done on the instruction of the defendant. At the time the defendant was under an obligation to carry out the repairs to the building in St. Mary's-street, and lay out a sum of about 800*l.* on the premises. The plans were prepared and sent to the Urban Sanitary Authority, but they were returned to be amended in some slight particulars. The plaintiff wrote to the defendant reporting the result of the submission of plans, and asked him to call so that alterations could be carried out; but Mr. Kaphan instead of going near the plaintiff had other repairs of a different character, having purchased the freehold in the meantime. The defendant had declined to pay these usual charges.

Plaintiff gave evidence in support of his case, bearing out the statement made by Mr. Lamport, stating in reply to Mr. Emanuel that he was trying to do his best for the defendant in the plans, and the Council sometimes made concessions. He could very easily alter the plans to meet the requirements of the by-laws, and would have done so free of cost.

COMPETITIONS, CONTRACTS, AND PUBLIC APPOINTMENTS.

COMPETITIONS.

Nature of Work.	By whom Advertised.	Premiums.	Designs to be delivered.
Infectious Diseases Hospital	Penzance Town Coun.	31*l.* 10s. 21*l.* and 15*l.* 15s.	Mar. 19
Technical Institute and Library	West Ham Town C.	250*l.* 150*l.* 100*l.*	May 1
*Shops, Offices, Two Hotels, &c. Preston	N. Miller	150*l.* 100*l.* and 50*l.*	May 27
Sewage Disposal Scheme	Hemel Hempstead R.D.C.	105*l.*	June 1

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.
Road Works	Cardiff Corporation	W. Harpur	Feb. 26
Shop, New Deer, Aberdeen	James Mackie & Co.	J. Duncan	do.
Flags, Kerbs, Setts, &c.	Bury (Lancs.) Corp.	*Official*	do.
*Well in Brickwork and Cast-Iron Cylinders	East Cowes U.D.C.	Lemon & Blizard	do.
*Works and Materials	Willesden Dist. Coun.	O. Claude Robson	do.
*Road Making and Paving Works	do.	do.	do.
Additions, &c to Schools, Wood House	Normanton Sch. Bd.	R. N. Hunter	Feb. 27
Temperance Hall and Rooms, Fountain-street, Morley, Yorks.	Morley Temperance Soc.	T. A. Buttery	do.
Cast-iron Pipes, &c. (137 tons)	Halifax Corporation	E. R. S. Escott	do.
Sewerage Works (910 yds.), Hebble Brook	do.	do.	do.
Thirty Cottages, Ystrad Rhondda, Rhondda Valley, Glam.			do.
Warehouse, Vicar-lane, Bradford, Yorks.	W. Williams		do.
Paving and Forming Donald and other Streets	Bradford Prov. Indus. Soc. Lim.	Rycroft & Firth	do.
Road Metal, Greenock, N.B.	Cardiff Corporation	W. Harpur	do.
Six Houses, Bridge-road, Crombach, Aberdare	Renfrew C. C.	P. D. Alexander	do.
Alterations, &c. to Schools, Downham Market, Norfolk	L. Williams	T. Roderick	do.
Eight Cottages, Grangegorman	Southery School Board	*Official*	do.
Laying 3,960 yds. Waterpipes, Springwell, &c.	North Dublin U.R.S.A.	do.	do.
Guernsey Granite and Kentish Rag	Chester-le-Street R.D.C	do.	do.
	Cranbrook (Kent) R.D.C.	do.	do.
Farmhouse, Southfields, Auchtermuchty N.B.		David Storrar	Feb. 28
Additions, &c. to Wharncliffe Hotel; also other Buildings, near Camelford	Earl of Wharncliffe	Wise & Wise	do.
Additions to National Schools, Knaresborough		J. Gavin Brown	do.
*Supply of Materials	Lambeth Vestry	J. P. Norrington	do.
*Various Works	do.	do.	do.
Technical School, Richmond-terrace	Brighton Town Council	F. J. C. May	Mar. 1
Additions to Schools, near Walsall	Great Wyrley & Cheslyn Hay U. D. Sch. B.	Bailey & McConnal	do.
Piers, Baulks, &c Polperro, Cornwall	Harbour Trustees	*Official*	do.
*Mess Room, &c. Leicester	Midland Railway	do.	do.
Additions to Rectory, Grasmere	Rev. W. Jennings	R. Walker	Mar. 2
Outfall Sewerage Works, Tanks, &c. Summerseat, Lancs.	Ramsbottom U.D.C	Thos. Nuttall	Mar. 4
Enlarging School, Long Row	Belper School Board	M. Hunter	do.
Cottage Hospital, Wells, Somerset		W. J. Willcox	do.
*Brick Warehouse	King's Lynn Docks & Railway Co.	F. Valentine	do.
*Works and Materials	Hendon U.D.C.	S. S. Grimley	do.
*Supply of Materials	Camberwell Vestry	O. S. Brown	do.
*Carbolic Powder, Disinfectants, &c.	do.	do.	do.

CONTRACTS—*Continued.*

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.
*Purchase and Removal of Twelve Houses	Southwark & Vauxhall Water Co.	*Official*	Mar. 4
*Works and Materials	Rotherhithe Vestry	do.	Mar. 5
*Granite Cubes	Battersea Vestry	do.	do.
*Works and Materials	Kensington Vestry	do.	do.
*Wood Paving Works	Wandsworth Bd. of W.	do.	do.
*Post Office, Portsmouth	Com. of H. M. Works	do.	do.
*Supply of Materials	Leyton U.D.C.	W. Dawson	do.
*Additions to Schools	Wanstead School Bd.	J. T. Bressey	Mar. 6
Additional Court, Magistrate's Room, Offices, &c. Castle Green	Sheffield Corporation	Flockton & Gibbs	do.
*Works and Materials	Chiswick U.D.C.	*Official*	do.
*Making-up Roads	do.	A. Ramsden	do.
Sewage Disposal Works	Burley-in-Wharfedale U.D.C.	Preston & Waugh	do.
Schools, Navigation, Aberdare Junction	Llanwonno Sch. Bd.	A. O. Evans	do.
Kerbing and Flagging	Eccles (Lancs.) Corp.	A. C. Turley	do.
Road Materials	Castleton (Lancs.) U.D.C.	R. J. Webster	Mar. 7
Buildings, Barton Farm, Wendron, Cornwall	Pearce Jenkin		Mar. 9
Schools, Mothecombe (Devon)	Holbeton Sch. Bd.	*Official*	do.
*Underdrainage of Farm Lands	Cambridge Corp.	J. T Wood	Mar. 11
*Steam Crane, Weighing-Machine, &c.	Boro' of West Ham	L. Angell	Mar. 12
*Works and Materials	Fulham Vestry	*Official*	Mar. 13
*Works and Materials, Brighton	War Department	do.	Mar. 15
County Offices, &c Londonderry	D. R. Babington	do.	do.
*Sanatorium Buildings	Southend-on-Sea Corp.	W. Y. Hobbiss	Mar. 22
Enlargement of Workhouse	Pocklington Union	H. L. Tacon	Mar. 25
*Chancel and Organ Chamber, Blandford Church		C. Hunt	Mar. 26
Police Station, Chyandour	Standing Joint Com. & Cornwall County C.	O. Caldwell	April 2
Surveyor's Materials	Audenshaw (Lancs.) U.D.C.	J. H. Burton	No date
House, Cumwhinton, Carlisle	Wetheral Sch. Bd.	Johnstone Bros.	do.
*Painting, &c. Gravesend Barracks	War Department	*Official*	do.
*Class-room	Langley Manish Sch. Board	do.	do.
School Residence, St. James' Chapel, Hillsborough, co. Down	Rev. R. A. Kernan		do.
Pair Villas, Otley, Yorks.		Fairbank & Wall	do.
Additions, &c. to Christ Church Schools, Lancaster-street		G. D. Oliver	do.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.
*Building Inspector	Burton-upon-Trent Corp.	120*l.*	Feb. 25
Highway Surveyor	Tavistock R.D.C.	100*l.*	Feb. 26
Surveyor and Inspector	Farnham (Surrey) U.D.C.	160*l.*	do.
Highway Surveyor	Great Ouseburn R.D.C.		Feb. 28
Highway Surveyor, &c.	Kingsbridge (Devon) R.D.C.	105*l.*	do.
Highway Surveyor	Eton R.D.C.	150*l.*	do.
*Engineer and Surveyor	Dover Town Council	350*l.* &c.	Mar. 1
Gas and Water Engineer	Carlisle Corp.	500*l.*	Mar. 4
*Clerk of Works	Newington Vestry Baths Commrs.	[4*l.* 4s	do.
Highway Surveyor, Maidenhead	Cookham R.D.C.	150*l.*	do.
Four Highway Surveyors	Totnes U.R.D.C.		Mar. 7

Those marked with an asterisk (*) are advertised in this Number. *Competitions, p.* iv. *Contracts, pp.* iv., vi., vii., *and* viii. *Public Appointments, pp.* xix. *and* xxi.

Other witnesses gave evidence that the charges made were reasonable.

Replying to his Honour, Mr. Lamport contended that an architect would not lose his fees because the authorities did not sanction the plans, and especially was this the case when the architect was prepared to rectify the plans.

Mr. Emanuel, for the defence, urged that it was a novel situation for a surveyor to say he had made a mistake in his plans, that he had prepared plans which were useless, upon which the Borough Authorities would not allow him to proceed, and that he should write to the defendant asking him to come and show him what he was to put right. It was the duty of the plaintiff to send plans which could have been acted upon. He also contended that this was a contract to do the plans, and carry out the work for 5 per cent.; it must be taken as a whole, and was not divisible.

In reply to Mr. Lamport, defendant said he had been unable to build because he had become his own freeholder. When he had the money he intended to build, and would engage the plaintiff to superintend the carrying out of the work, but he would not pay anything on account.

William Henry Killick, assistant Borough Surveyor, spoke to the plans prepared not being in accordance with the by-laws.

His Honour non-suited the plaintiff without prejudice to an action in the future if the defendant ignored the plaintiff in his carrying out the building.

Mr. Emanuel assured his Honour that the defendant intended to build, but was waiting for the money.

Mr. Lamport said he was sorry he must appeal, as it was an important case to architects.

CAPITAL AND LABOUR.

STATE OF EMPLOYMENT IN JANUARY.—The February issue of the *Labour Gazette* refers to the effect which the severe frost has had on outdoor work during the latter part of the past month. The building trades in particular have been wholly or partly stopped in many districts, and the increase in the unemployed in these industries accounts almost entirely for the rise which has taken place in the percentage of unemployed members of trade unions making returns. Seventy-six trade unions, with an aggregate membership of 370,335, have made returns to the Department, showing the total number of unemployed members at the end of January to be 30,433, or 8·2 per cent., compared with 7·7 per cent. in the sixty-seven unions from which returns were received for December, and 7·0 per cent. in the thirty-seven unions making returns for January, 1894. In the building trades the percentage of unemployed members of unions making returns has increased from 5·7 to 8·2, compared with 6·7 per cent. in January, 1894. Fifty-seven new disputes occurred in the past month. Two of the seven disputes in the building trades were chiefly due to questions of wages, two arose in respect of questions of unionism, the remaining three being upon questions of working arrangements.

LONDON BUILDING TRADE.—A meeting took place on the 18th inst. at the offices of the Master Builders' Association, between the Executive Committee of that body and twenty-five delegates from the trade unions connected with the London Building Trades Federation. The proposed revision of the working rules of the London building trades was discussed for some hours, and the conference adjourned. Whilst nothing was made public, we have reason to believe that the matter was discussed by both sides in a conciliatory spirit, and that when on May 1 the notice given by the master builders to terminate the present working rules expires, a satisfactory settlement will be arrived at as to the drawing up of new ones.—*Daily Chronicle.*

MEETINGS.

FRIDAY, FEBRUARY 22.

Institution of Civil Engineers (Students' Meeting).—Mr. William G. Wales on "Caissons and Gates for Closing Lock and Dock Entrances." 8 p.m.

Royal Institution.—Professor A. Schuster on "Atmospheric Electricity." 9 p.m.

Sanitary Institute (Lectures for Sanitary Officers on Physics and Chemistry).—Mr. J. Castell-Evans on "Sanitary Chemistry." VI. 8 p.m.

SATURDAY, FEBRUARY 23.

Builders' Foremen and Clerks of Works' Institution.—Annual Dinner, The King's Hall, Holborn Restaurant, 6.30 p.m.

Institution of Junior Engineers.—Visit to Messrs. Siemens Bros. & Co.'s works, Woolwich. Reception by the President, Mr. Alexander Siemens. Train from Charing Cross at 9 20 a.m. Book to Charlton.

Queen's College, Cork.—Mr. Arthur Hill on the "History of Architecture." XII. 3 p.m.

MONDAY, FEBRUARY 25.

Royal Institute of British Architects.—Mr. Thomas W Aldwinckle on "Fever Hospitals." 8 p.m.

Royal Academy (Lectures on Sculpture).—Mr. A. S. Murray on "The Schools of the late Sixth and Early Fifth Century, B.C." III. 8 p.m.

Sanitary Institute (Lectures and Demonstrations for Sanitary Officers).—Sir Douglas Galton on "Ventilation, Warming, and Lighting." 8 p.m.

TUESDAY, FEBRUARY 26.

Society of Arts (Applied Art Section).—Miss May Morris on "Mediæval Embroidery." 8 p.m.

Institution of Civil Engineers.—(1) Paper to be further discussed:—"Plant for the Extraction of Gold by the Cyanide Process." By Mr. Charles Butters and Mr. Edgar Smart. (2, time permitting) (*a*) Mr. Robert Robertson on "Electrical Haulage at Earnock Colliery." (*b*) Mr. Robert Hay on "Electricity Applied to River Gold-Dredging." 8 p.m.

Sanitary Institute (Lectures and Demonstrations for Sanitary Officers).—Mr. H. Manley, M.A., on "Sanitary Law: English, Scotch, and Irish; General Enactments, Public Health Act, 1875; Model By-laws, &c." 8 p.m.

WEDNESDAY, FEBRUARY 27.

Northern Architectural Association.—Mr. C. H. Howden on "Organs and Organ Chambers." 7.30 p.m.

THURSDAY, FEBRUARY 28.

Institution of Electrical Engineers.—Mr. W. B. Sayers on "Reversible Regenerative Armatures and Short Air Space Dynamos." (Continuation of discussion.) 8 p.m.

Civil and Mechanical Engineers' Society.—Mr. A. S. E. Ackerman on "Testing the Strength of Materials." 7 p.m.

Society of Antiquaries.—8.30 p.m.

FRIDAY, MARCH 1.

Architectural Association.—(1) Mr. T. Stirling Lee on "The Use of Sculptural Decoration at the Present Time." (2) Mr. T. W. Pomeroy on "Plaster Work." 7.30 p.m.

Sanitary Institute (Lectures and Demonstrations for

Sanitary Officers).—Professor A. Wynter Blyth on "The Law Relating to the Supervision of Food Supply." 8 p.m.

SATURDAY, MARCH 2.

Queen's College, Cork. — Mr. Arthur Hill on the "History of Architecture." XIII. 3 p.m.

Edinburgh Architectural Association.—Visit to Royal Observatory, Blackford Hill.

RECENT PATENTS:

ABSTRACTS OF SPECIFICATIONS.

4,708.—CHIMNEYS: *J. Chadwick.*—To prevent down-draught in chimneys without the use of a cowl, two passages are, according to this patent, made on opposite sides of the chimney-stack. In connexion with these, deflectors are arranged by means of a metal frame pivotted in the chimney-stack.

4,865.—VENTILATORS: *C. P. Titherley.*—To withdraw air from heated rooms, a shaft, provided with a number of internal baffle-plates, is surmounted by hat-shaped rings placed consecutively one above the other. The rings slope upward from the outside, and are arranged so as to encourage the up-draught of air from the room.

5,123.—PAINT-BRUSHES: *K. Stiehle.*—Relates to a metal binding or bridle of metal for paint-brushes. The bristles are held by a threaded socket, and may be adjusted to any length by another socket which can be screwed over it.

6,823.—PLUMB RULE AND BRICKLAYERS' GAUGE.—Consists of a rule having two graduated blades arranged at right-angles, and adapted to be secured to the corner of a wall. The two parts of the rule are united by bolts, and when fixed the blades of the two parts are in alignment with each other. The rule is attached to the wall by nails driven through holes provided in the blades. A spirit-level is used to ensure correctness of adjustment.

14,360.—RAISING AND LOWERING WINDOWS: *R. Lawson.*—Chiefly for carriage-windows, to prevent rattling and draught. A toothed piece of metal is secured in a groove on each side of the window-frame. Two bolts which engage with the teeth of the ratchet slide in tubes affixed to the sash-frame, and are operated upon by arms attached to a wheel which turns on a spindle hung between two plates, one of which carries a sash-lift. On pressing a catch attached to the spindle the wheel revolves and withdraws the bolts so that the windows can be raised or lowered.

20,677.—TRAPS FOR WATER-CLOSETS: *R. T. Moore.*—Consists in making a syphon-trap discharge-pipe and connexion with soil and ventilating-pipe in one piece. The discharge-pipe is arranged so that the soffit is retained in a horizontal position, while the invert is inclined enough for discharging purposes. An examining eye-plate is provided for examining inside of trap.

24,011.—SCREWS: *E. Cowchen.*—For providing a more convenient head for wood and other screws, a projecting ridge is formed across the head of the screw instead of the usual cross-cut.

NEW APPLICATIONS FOR LETTERS PATENT.

FEBRUARY 5.—2,469, T. Wearden, Tile for Decorative Purposes, also Applicable for Signs.—2,486, P. Treadgold, Appliance to be Affixed to Doors, &c., to Prevent the Entrance of Wind, Snow, &c.—2,499, E. Hughes and L. Campbell, Screw Safety-lift for Buildings and Cliffs.—2,546, H. Jelley and R. Dorrett, Planing or Working of Wood.

FEBRUARY 6.—2,582, H. Sutcliffe, Chimney Tops or Cowls.—2,600, F. Hughes and J. Webb, Automatic Door Stop and Holdfast Hook.—2,603, W. Nicol, Fastenings Connected with the Sliding Sash Frames of Windows.

FEBRUARY 7.—2,694, W. Ingham, Ventilation.—2,699, G. Hewett and A. Jolley, Kilns.—2,703, H. Green, Rising Butt Hinges and other Hinges.—2,744, T. Robinson, Window or Sash Fastener.

FEBRUARY 8.—2,769, J. & A. Carr, Decorations for Shop-fronts, &c.—2,774, J. Landells, Water or Earth Closet Pans.—2,800, W. O. Sment, Producing Raised Panels and Mouldings on Square Balusters, &c.—2,809, S. Williams and J. Owen & Sons, Bending Wood.—2,822, W. Shoosmith, Closet-traps.—2,833, J. Akers and G. Mitchell, Fastenings for Window-sashes, &c.

FEBRUARY 9.—2,845, M. Bohn, Roofing Tiles.—2,865, J. Shanks, jun., Discharge Apparatus of Water-closet or other Cisterns.—2,876, R. Neal, Intercepting-trap for Disconnecting House Drains with Sewers.—2,880, G. Horsfield and J. White, Saw-handles.—2,912, J. Fallshaw, Window-sash Fasteners.

PROVISIONAL SPECIFICATIONS ACCEPTED.

85, E. Drew, Utilising the Heat resulting from Combustion which ascends Chimneys of Buildings.—97, F. Armstrong, Screw-down Tap.—244, G. Stenning, Handle for Screwdrivers.—306, H. Wall, Pigments or Colours.—414, F. Crane, Paints or Driers.—1,124, J. Rickard, Dovetail Cutting Machine, Mitreing Machine, and Squaring Machine Combined.—1,173, E. Bonson, Fireproofing System for Floors, &c.—1,432, H. Mills, Attaching and Securing Door and other Knobs to their Spindles, and in Roses in connexion therewith.—1,441, J. Littlehales and G. Martin, Dry Glazing.—1,663, W. Davis, of firm of Marshall Bros., Drain-cleaning Machines, &c.—1,693, W. Crombie and the Paragon Bolt Syndicate, Limited, Mortice Bolt.

COMPLETE SPECIFICATIONS ACCEPTED.

(Open to Opposition for Two Months.

3,359, H. Clay, Boilers for Ranges.—6,807, J. Railton, jun., Kilns.—7,937, R. Yorke, Metal Pipes.—22,795, M. Adams, Sanitary Closets.—24,648, H. Hoopmann, Roofing Tiles.—25,345, J. Blume, Facing Plates for Walls or Tiles.

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

FEBRUARY 12.—By *W. R. Smith & Son*: 138, High-st., Deptford, f., r. 30*l.*, 600*l.*—By *C. W. Davies:* 106, Dartmouth Pk. Hill, Highgate, u.t. 82 yrs., g.r. 7*l.*, 315*l.*—By *Cockett & Henderson:* 55, Sydney-st., Kensington, u.t. 34 yrs., g.r. 6*l.*, r. 60*l.*, 550*l.*

FEBRUARY 13.—By *J. W. Coade:* The Scordale Lead Mines, Appleby, Westmoreland, area 7,600 acres, with plant and machinery, u.t. 24 yrs., g.r. 20*l.*, 1,100*l.*; 8, Gray-st., Manchester-sq., f., r. 100*l.*, 2,500*l.*; 34, Landseer-rd., Holloway, u.t. 63 yrs., g.r. 6*l.* 6s., r. 30 ., 250*l.*—By *P. H. Clarke:* 19, Jessop-rd., Herne Hill, u.t. 71 yrs., g.r. 5*l.*, 220*l.*—By *Douglas Young:* 48 and 50, Union-grove, Clapham, u.t. 30 yrs., g.r. 14*l.* 10s., 495*l.*; 23 and 25, Wycliffe-rd., Wandsworth, u.t. 71 yrs., g.r. 10*l.*, 350*l.*—By *Prothero & Morris:* "The Wyer Hall Nurseries," Tanner's End, Edmonton, about 10 acres, u.t. 16 yrs., r. 80*l.*, with stock, goodwill, &c., 980*l.*—By *Beal & Myrtle:* 28, 30, 32, and 34, Kelson-st., Kilburn, and plot of land with buildings in rear, u.t. 83 yrs., g.r. 33*l.*, 1,100*l.*

FEBRUARY 14.—By *Jones, Lang, & Co.:* No. 69, Bishopsgate-st. Without, f., r. 195*l.*, 3,750*l.*; 41, 42, 43, and 44, Railway-st., Bromley-by-Bow, f., 665*l.*—By *Newbon & Co.:* 35, 37, 39, and 41, Devonshire-st., Islington, f., r. 200*l.*, 2,800*l.*; 34, Horsell-rd., Highbury, u.t. 90 yrs., g.r. 7*l.* 15s., 390*l.*; 11, Aubert Pk., u.t. 42 yrs., g.r. 3*l.* 3s., r. 90*l.*, 650*l.*; 13, Aubert Pk., u.t. 54 yrs., g.r. 8*l.*, 475*l.*; 15, Aubert Pk., u.t. 54 yrs., g.r. 12*l.*, r. 100*l.*, 700*l.*; 52, Landseer-rd., Holloway, u.t. 63 yrs., g.r. 5*l.* 5s., r. 36*l.*, 300*l.*; 9, Queen's-cres., Haverstock Hill, u.t. 65 yrs., g.r. 10*l.*, r. 45*l.*, 345*l.*; 2 to 16, Millbrook-rd., Edmondton, u.t. 97 yrs., g.r. 60*l.*, 1,255*l.*; 196, Kentish Town-rd., Kentish Town, u.t. 53 yrs., g.r. 12*l.*, r. 66*l.*, 700*l.*—By *C. C. & T. Moore:* 123, Leyton-rd., Stratford, f., 290*l.*; 92 and 94, Grundy-st., Poplar, u.t. 34 yrs., g.r. 6*l.* 5s., 225*l.*; 8, 10, and 11, Maplin-st., Mile End, f., r. 81*l.* 18s., 600*l.*; 45, 47, and 49, Ida-st., Poplar, f., r. 78*l.*, 550*l.*; 40, Tetley-st., f., 160*l.*; freehold shed and yard, Carman-st., r. 18*l.* 4s., 110*l.*; 2 and 4, Southhill-st., u.t. 63 yrs., g.r. 7*l.*, 200*l.*; 72, Upper North-st., u.t. 33 yrs., g.r. 4*l.*, 170*l.*; 133 to 143 (odd), Upper North-st., u.t. 57 yrs., g.r. 24*l.*, 730*l.*; 77, Augusta-st., u.t. 33 yrs., g.r. 2*l.*, r. 21*l.*, 135*l.*; 111, Blair-st., a range of stabling, u.t. 86 yrs., g.r. 24*l.* 5s., 575*l.*; 1, 3, 5, 7, and 9, Bright-st., Bromley-by-Bow, u.t. 58 yrs., g.r. 13*l.* 10s., 825*l.*; 4 to 14 (even), Willis-st., and 1, 2, and 3, Greenfield-st., f., 900*l.*; 85, 87, 89, 90, 91, and 92, Nelson-st., u.t. 4 yrs., g.r. 10*l.* 16s., 95*l.*—By *Messrs. Trollope:* 272, Vauxhall Bridge-rd., Pimlico, f., r. 50*l.*, 1,080*l.*; 274, Vauxhall Bridge-rd., f., r. 60*l.*, 1,220*l.*—By *H. J. Perry:* 24, Farmer-st., Notting Hill, u.t. 54 yrs., g.r. 5*l.*, r. 41*l.* 12s., 275*l.*—By *Stimson & Sons:* 36, Sutton-st., Lambeth, u.t. 21 yrs., g.r. 6*l.* 10s., r. 34*l.*, 190*l.*; 750, Fulham-rd., Fulham, u.t. 77 yrs., g.r. 3*l.* 10s., r. 48*l.*, 500*l.*; 752, 754, and 756, Fulham-rd., u.t. 77 yrs., g.r. 16*l.* 10s., r. 120*l.*, 1,390*l.*; 65, Cook's-rd., Kennington, u.t. 55 yrs., g.r. 6*l.*, r. 30*l.*, 280*l.*; 4, Thurleigh-rd., Wandsworth, u.t. 86 yrs., g.r. 9*l.*, r. 46*l.*, 465*l.*; 16, Thurleigh-rd., u.t. 86 yrs., g.r. 8*l.* 15s., r. 48*l.*, 470*l.*; 24, Thurleigh-rd., u.t. 86 yrs., g.r. 8*l.* 15s., r. 46*l.*, 470*l.*; 94, Bennerley-rd., Battersea, u.t. 81 yrs., g.r. 6*l.*, r. 30*l.*, 285*l.*; 33, Almeric-rd., u.t. 231 yrs., g.r. 6*l.* 6s., r. 35*l.*, 285*l.*—By *Worsfold & Hayward* (at Dover): 21, and 24, Barton-rd., Dover, f., r. 36*l.*, 640*l.*; 65, Folkestone-rd., f., r. 19*l.* 19s., 370*l.*; 303, London-rd., f., 500*l.*; 115, and 117, Clarendon-pl., f., 415*l.*; 8, Tower Hamlets-st., f., 130*l.*; 6 and 7, Tower-st., Charlton, near Dover, f., 265*l.*

FEBRUARY 15.—By *Baker & Sons:* i.g.r. of 80*l.*, Church-st., &c., Paddington, u.t. 34 yrs., g.r. 12*l.* 6s. 8d., 1,220*l.*; 8, St. Mary's-sq., u.t. 43 yrs., g.r. 7*l.* 10s., r. 55*l.*, 600*l.*; 102 and 104, Harrow-rd., u.t. 43 yrs., g.r. 10*l.*, r. 45*l.*, 630*l.*; 19 and 21, Fulham-pl., u.t. 43 yrs., g.r. 20*l.*, r. 110*l.*, 800*l.*; 29, 31, 33, and 35, Canterbury-rd., Kilburn, u.t. 162 yrs., g.r. 20*l.*, 670*l.*; 14, 18, and 24, Albert-rd., u.t. 64 yrs., g.r. 15*l.* 15s., 605*l.*; 13 to 16, Kilburn Vale, f., 350*l.*; four plots of f. land, Semerna-rd., Hampstead, 880*l.*; f.g.r. of 35*l.*, High-st., Wimbledon, reversion in 88 yrs., 940*l.*—By *G. B. Smallpiece:* 54, 56, and 58, Brompton-rd., Knightsbridge, f., r. 345*l.*, 7,050*l.*: f.g.r. of 30*l.*, High-st. Whitechapel, reversion in 22 yrs., 1,260*l.*—By *Eastman Bros.:* "Hawthornden," and 2 r. 30 p., Lawrie Park-rd., Sydenham, f., 1,350*l.*

Mr. H. A. Henderson, F.S.I., of 70, Finsbury Pavement, E.C., has sold by private treaty a freehold ground rent secured by residential flats at Chelsea for the sum of 15,925*l.*

[*Contractions used in these Lists.*—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; e.r. for estimated rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; yd. for yard, &c.]

PRICES CURRENT OF MATERIALS.

TIMBER.

Greenheart, B.G.	ton	8/0/0 0/0/0
Teak, E.I.	load	10/0/0 16/0/0
Sequola, U.S. ft. cu		1/10 2/2
Ash, Canada load		3/0/0 4/5/0
Birch, do.		3/0/0 4/5/0
Elm, do.		3/15/0 5/0/0
Fir, Dantsic, &c.		1/10/0 3/5/0
Oak, do.		2/15/0 4/15/0
Canada		5/5/0 6/15/0
Pine, Canada red		2/15/0 3/5/0
Do. Yellow		3/10/0 5/15/0
Lath, Dantsic, fath		4/10/0 5/10/0
St. Petersburg		5/0/0 6/10/0
Wainscot, Riga, &c., log		2/15/0 5/0/0
Odessa, crown		2/15/0 5/0/0
Deals, Finland		
2nd & 1st std 100		7/0/0 9/0/0
Do. 4th & 3rd		7/0/0 8/0/0
Do. Riga		7/0/0 8/10/0
St. Petersburg, 1st yellow		9/10/0 12/0/0
Do. 2nd yellow		7/10/0 9/0/0
Do. white		8/0/0 9/10/0
Swedish		7/0/0 15/10/0
White Sea		7/10/0 15/0/0
Canada, Pine 1st		21/0/0 24/10/0
Do. do. 2nd		16/10/0 17/10/0
Do. do. 3rd, &c.		8/0/0 10/10/0
Do. Spruce, 1st		8/10/0 10/0/0
Do. do. 3rd and 2nd		6/10/0 7/10/0
New Brunswick		6/0/0 7/0/0
Battens, all kinds		5/0/0 21/0/0
Flooring boards, sq., 1 in. prep. 1st		0/9/6 0/14/0
Do. 2nd		0/7/0 0/11/6
Other qualities—		0/5/0 0/7/0
Cedar, Cuba	ft.	/3 /4
Honduras, &c.		/3 /4½
Mahogany, Cuba		/3½ /6
St. Domingo, cargo av.		/3½ 1/6
Mexican do. do.		/3 /4
Tobasco do. do.		/3½ /6
Honduras do.		/3½ /5½
Box, Turkey	ton	4/0/0 15/0/0
Rose, Rio		7/0/0 16/0/0
Bahia		6/0/0 15/0/0
Satin, St. Domingo		0/0/5 0/1/0

TIMBER (*continued*).

Satin, Porto Rico	0/0/6	0/1/6
Walnut, Italian	0/0/3½	0/0/7

METALS.

Iron—Pig, in Scotland	ton	2/1/4 0/0/0
Bar, Welsh, in London		5/12/6 5/15/0
Do. do. at works in Wales		5/2/6 5/5/0
Do. Staffordshire, in London		6/0/0 6/10/0
COPPER—British cake and ingot		42/5/0 42/15/0
Best selected		43/0/0 43/10/0
Sheets, strong		50/0/0 0/0/0
Chili bars		39/10/0 39/15/0
YELLOW METAL	lb	0/0/4½ 0/0/4½
LEAD—Pig, Spanish	ton	9/10/0 9/11/3
English com. brands		9/11/3 9/13/9
Sheet, English, 6 lbs. per sq. ft. and upwards		10/15/0 11/0/0
Pipe		11/15/0 0/0/0
ZINC—English sheet	ton	18/10/0 19/0/0
Vieille Montagne		19/10/0 0/0/0
TIN—Straits		60/2/6 60/12/6
Australian		60/5/0 60/15/0
English Ingots		63/0/0 63/10/0
Banca		61/10/0 62/0/0
Billiton		60/10/0 61/0/0

OILS.

Linseed	ton	21/5/0 21/7/6
Cocoanut, Cochin		25/0/0 0/0/0
Do. Ceylon		23/0/0 0/0/0
Palm, Lagos		23/0/0 0/0/0
Rapeseed, English pale		22/0/0 0/0/0
Do. brown		20/10/0 0/0/0
Cottonseed ref.		17/5/0 18/5/0
Oleine		21/0/0 22/10/0
Lubricating, U.S.		4/0/0 5/0/0
Do. refined		5/0/0 12/0/0
TAR—Stockholm	barrel	1/1/0 1/1/6
Archangel		0/15/0 0/16/0

TENDERS.

[Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than* 10 *a.m. on Thursdays.*]

BELFAST.—For the construction of sewer, York-road and Skegoniel-avenue, for the Corporation. Mr. J. C. Bretland, City Surveyor, Belfast:—

Workman & Co., Townsend-street, Belfast	£319

BILSTON (Staffs.).—For the erection of engine-house, &c., at the pumping-station, The Bratch, Wombourn, for the Urban District Council. Mr. Baldwin Latham, C.E., 13, Victoria-street, Westminster, S.W. Quantities by Messrs. Hovenden & Barber, 30, Bishopsgate-street Without, E.C.:—

R. Fenwick	£8,795 0 0	Henry Hill	£6,549 6 7
George Law	8,212 0 0	Herbert Holloway	6,427 9 9
Smith & Boocock	7,523 0 10	Thomas Tildesley	6,423 17 4
Morrell Bros.	7,478 1 6	Jacob Biggs	6,368 19 3
Perrin & Long	7,272 19 4	F. Lindsay Jones	6,290 0 0
Currall, Lewis, & Martin	6,959 3 5	H. Smith	5,782 10 11
Henry Gough	6,939 13 7	H. Willcock & Co., Wolverhampton*	5,718 6 6
Benjn. Guest	6,597 9 0	George Trentham	5,247 13 7
Peter Peters	6,470 11 0	* Accepted.	

BLACKBURN.—For the erection of eight houses, Whalley Old-road, for the Daisyfield Co-operative Society, Limited. Mr. John B. Thornley, architect, 45, Market-street, Darwen:—

J. Walmsley	£2,541	J. Parker	£2,320
J. Whittaker & Sons	2,479	Lloyd & Millward, Darwen*	2,104
Harry Smith	2,381	Shuttleworth	2,025
J. Highton & Sons	2,334	* Accepted.	
W. & A. Greyson	2,322		

BOLTON.—For the execution of sewering and other street works, Powell-street and fourteen others (three contracts), for the Town Council:—

Contracts 693-4.—William Pollitt, Pool-street, Bolton (as per Schedule of Prices).
Contract 695.—James Hope, Beckett-street, Halliwell (as per Schedule of Prices).

BUCKIE (Elgin).—For the erection of a block of buildings on The Square. Mr. Geo. Sutherland, architect, Elgin:—

Masonry.—A. Milne	£1,200
Carpentry.—A. Hendry & Son	
Slating.—John Barclay	
Plumbing.—John Barclay	
Plastering.—Henne & Co.	
Painting.—Symon & Sons	

[All of Buckie.]

BUNGAY.—For the erection of permanent race-stand to seat 600. Mr. Reuben G. Norman, architect, Wainford, Bungay, Suffolk:—

Jas. Clutton	£374 12 6	Martin & Son	£313 0 0
Morriss & Son	363 10 0	A. D. Botwright, Bungay (accepted)	292 5 2
Humphreys	353 0 0		

CARDIFF.—For the conversion of a chapel into a hall, Guildford-street, for the Cardiff Masonic Hall Company, Limited. Mr. George Thomas, architect, Queen's-chambers, Cardiff. Quantities by architect:—

Geo. Griffiths	£2,229 0 0	Williams & Hoare	£1,803 0 0
Jno. Gibson	2,048 0 0	O. Purnell	1,747 0 0
Jno. Haines	1,992 15 9	Knox & Wells	1,735 0 0
Robins	1,930 0 0	Joseph Thomas	1,730 0 0
Lattey & Co.	1,887 0 0	James Allen	1,729 0 0
H. Davies	1,886 13 5	E. Turner & Sons	1,668 0 0
Rees & Thomas	1,883 13 4	E. R. Evans & Co.*	1,636 10 11
D. Davies	1,815 0 0	* Accepted.	

[All of Cardiff.]

CHESTER-LE-STREET (Durham).—For re-building premises, Front-street, for Mr. T. W. Rowe, of Newcastle-on-Tyne. Mr. H. T. Gradon, architect, 22, Market-place, Durham:—

Turner Bros.	£916 4 9	Henry Mole	£766 0 0
Wm. Norman	888 0 0	Isaac Oates	747 15 0
Geo. T. Manners	809 0 0	M. R. Draper & Son	709 16 5
J. Jopling	788 9 10	Kell & Groves, Chester-le-Street*	706 16 0
Thompson & Son	787 6 8	* Accepted.	
John Jennings & Son	780 0 0		

CLONES (Ireland).—For the execution of water-supply works for the Town Commissioners. Mr. J. H. H. Swiney, C.E., Avenue-chambers, Belfast. Quantities by engineer:—

P. Harney	£4,400 0 0	Hickson & Peet	£3,296 10 0
Jno. Cunningham	4,360 8 3	R. Walsh	3,272 16 9
Jno. McNally	4,138 16 0	Jas. McLarnon	3,248 10 7
Geo. Lawson	3,900 0 0	Michael Green	3,218 7 2
Thos. J. Dickson	3,764 10 3	McMahon & Gray, Clones (accepted)	2,899 9 7½
Jas. Harvey	3,688 0 0		
Geo. L. Johnston	3,498 17 7		

CROYDON.—For the erection of boundary walls, &c., at the infirmary, Mayday-rd., for the Union Guardians. Mr. Fred. West, surveyor, 23, Coombe-road, Croydon. Quantities by the surveyor:—

T. Brooks	£352 0	J. W. Jones	£230 0
P. R. Hubbard	345 0	Alfred Bullock	229 0
G. P & H. Barnes	320 0	G. E. Bryan & Son	223 0
A. Jones	249 0	H. Bacon	218 10
S. Page	248 0	Streeter Bros.	207 0
Windebank & Co.	247 0	W. Smith & Son	189 0
J. Smith & Sons	247 0	Umlandt & Nicholl	187 0
W. Marriage & Co.	240 0	F. W. Sedgwick, Croydon*	179 10
		* Accepted.	

GREAT YARMOUTH.—For the erection of the "Excursion-Train" tavern, North Quay, for Messrs. E. Lacon & Co., Limited. Mr. James E. Teasdel, architect, 3, Queen-street, Great Yarmouth:—

Carter & Wright	£1,304 0 0	H. Wall	£1,134 0 0
R. Eastoe	1,205 10 0	Moore & Wright	1,124 0 0
T. Howes	1,179 0 0	J. Harman	1,111 12 0
J. F. W. Bray	1,168 0 0	Read & Curtis	1,110 0 0
A. E. Bond	1,156 12 11	J. W. Cockrill & Son, Gorleston*	1,068 0 0
W. Cork	1,151 0 0	* Accepted.	
F. Grimble	1,135 0 0		

HOVE (Sussex).—Accepted for road-making, paving, &c., Shoreham-road, for the Urban District Council. Mr. H. H. Scott, Town Surveyor, Town Hall, Hove:—

W. H. Holman & Co., 27, Gladstone-place, Brighton	£376 0 0

LONDON.—Accepted for alterations, &c., at "The Old Farm-House" public-house, Kentish Town-road, N.W., for Mr. Henry Green. Mr. A. E. Pridmore, architect, 2, Broad-street Buildings, E.C.:—

Marchant & Hirst	£249

LONDON.—For the construction of a footbridge and approaches thereto, at Parliament Hill, for the London County Council:—

G. Palmer	£4,298 8 1	Darlington Wagon Co.	£2,865 9
T. Gibson	3,498 13 6		

LONDON.—For the construction of 12 in. pipe-sewers, Surrey-road and Rye-road, Peckham-rye, for the Camberwell Vestry. Mr. O. S. Brown, Surveyor, Works Department, Vestry-hall, Camberwell, S.E.:—

	Rye-road.	Surrey-road.
R. Ballard	£235 14 0	£307 2 0
T. Adams	230 0 0	305 0 0
H. Cox	228 9 0	293 10 4
J. Jackson	221 9 6	284 0 4
Robertson & Grant	218 11 0	281 11 0
Mayo & Co.	210 17 0	271 1 0
W. H. Wheeler	180 15 0	246 17 0
Killingback & Co.	185 18 0	236 16 4
S. Saunders*	179 0 0	231 9 0
J. Gloag	176 19 0	229 8 0

* Accepted.

LONDON.—For the supply of 300 tons of Guernsey granite spalls, for the Edmonton Union Guardians:—

	Per ton. s. d		Per ton. s. d.
R. L. & J. Fennings	11 2	A. & F. Manuelle, 101, Leadenhall-street*	10 2
W. Griffiths	10 11		
J. Mowlem & Co.	10 11		

* Accepted.

LONDON.—Accepted for pulling down the "Queen's Head" public-house, St. John-street, Smithfield, E.C., and building a provision warehouse for Messrs. J. D. Link & Son. Mr. Lewis Solomon, architect, 55, New Broad-street:—

William Reason, Clerkenwell £1,750

LONDON.—For alterations to No. 11, Church-street, Westminster, for Mr. J. L. Moore. Messrs. Waring & Nicholson, architects, 55, Parliament-street, Westminster, S.W.:—

D. Charteris	£485	F. C. Hoskins	£415
Wm. Larter & Son	450		

LONDON.—For alterations and additions to workshops and stables, at Drummond-street, Hampstead-road, for Messrs. Foxall & Co.:—

Welch & Close ..... £122 14 | John Weibking & Sons * £107 15

* Accepted.

MAIDSTONE.—For alterations to premises and fitting up ladies lavatories and cloak-room; also for alterations to Office of Inspector of Weights and Measures, for the Maidstone Corporation. Mr. T. F. Bunting, Borough Surveyor:—

	Lavatories.	Offices.
A. N. Pryer & Co.	£137	
H. Cruttenden	£108 16 0	£21 15 0
G. E. Wallis & Sons	103 0 0	18 10 0*
T. J. Barden	93 8 2*	29 0 0
[Surveyor's estimate	100 9 1	19 8 5.]

* Accepted.

NEWBRIDGE (Mon.).—For the erection of a public hall, for the Public Hall Company, Newbridge:—

R. C. Harris	£795 0 0	W. A. Baker & Co.	£595 0 0
Croggon & Co.	785 0 0	Francis Morton & Co.	585 10 0
W. Harbrow	679 0 0	W. Glover & Son	573 10 0
North & Son	649 0 0	Clarence Wharf Co.	565 11 6
Humphreys & Co.	642 0 0	F. H. Warden	550 0 0
Thos. J. Hawkins	609 5 0	E. F. Blakeley & Co.	526 0 0
J. Lysaght	605 0 0	C. F. Morgan, Newbridge, Mon.*	518 0 0
Ellis Williams	605 0 0	R. Rowsell	490 17 0
Dyne, Steel, & Co.	600 14 0	C. Bunning	462 15 0
Jas. Lee	596 0 0	A. I. Colborne	453 7 6
Clark & Balmer	595 5 0		

* Accepted.

TONBRIDGE.—For the pulling-down and re-building of the "Dorset Arms," High-street, Tonbridge, for Messrs. W. & G. Bartram & Co., Lim. Mr. J. W. Little, architect:—

Crates	£1,450 0	Punnett	£1,221 6
Gallard	1,349 0	Langridge	1,172 0
Penn	1,329 0	Jones, Tonbridge*	1,115 7

* Accepted.

WAKEFIELD.—For proposed houses, shops, stabling, &c., Upper Kirkgate, Wakefield, for Mr. S. N. Woodcock, Wakefield. Mr. Edward Tattersall, architect and surveyor, Thinhill-street, Wakefield:—

Bricklaying and Masonry.—Flowers Bros.
Joinery.—Bramald & Broadhead.
Slating.—J. Illingworth.
Plumbing.—S. Atkinson
Plastering.—T. C. Tattersall
Painting.—Goodall, Lister, & Goodall
Whitesmithing.—Geo. Batley
} £1,479

WALTON-ON-THAMES.—For the erection of a house at Walton-on-Thames, Surrey, for Mr. H. Machin. Messrs. Inman & Jackson, architects, 7, Bedford-row, W.C.:—

L. Whitehead & Co.	£1,780	C. Horsell	£1,514
T. C. Watson	1,666	James Smith	1,395
E. J. Ingram	1,560		

WEST HAM.—For the execution of concrete *situ* paving, Drew-road and Manor-road, for the School Board. Messrs. J. T. Newman & Jacques, architects, 2, Fen-court, E.C.:—

	Drew-road.	Manor-road.
Wm. Adamson	£199 19 0	£257 7 6
Bradford & Co.	227 13 0	288 17 3
Ellis & Son	212 17 9	280 8 0
Garstin & Son	226 0 0	291 15 0
J. Hancock	229 0 6	283 18 4
Hindley & Co., Manchester*	148 0 0	192 17 4
Imperial Stone Co.	228 19 3	304 6 9
Jones's Annealed Concrete Co.	234 9 2	307 5 10
Malcolm McLeod & Co.	189 14 11	241 15 4
Metallic Paving Co.	200 14 9	256 12 10
Mowlem & Co.	239 0 0	314 0 0
Patent Paving and Construction Co.	210 0 0	275 0 0
Patent Indurated Co.	189 15 10	248 7 2
Patent Victoria Stone Co.	223 0 10	293 3 5

* Accepted.

WREXHAM.—Accepted for the construction of a new street, 90 yards in length, with drains, &c., for Mr. R. H. Done. Mr. John E. Thomas, C.E., 50, Chester-street, Wrexham:—

Mr. W. E. Samuel, Wrexham £198 0 0

*** NEW HOUSE, RUSHAM PARK AVENUE, EGHAM.—With regard to the tender for this work, published in our last issue, we are asked to state that Mr. J. Sleep's estimate for the house is accepted at £849 7s, not £779. We printed the list as we received it.

TO CORRESPONDENTS.

J. S. M. (ineligible for insertion; trades not specified).

We are compelled to decline pointing out books and giving addresses.

NOTE.—**The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.**

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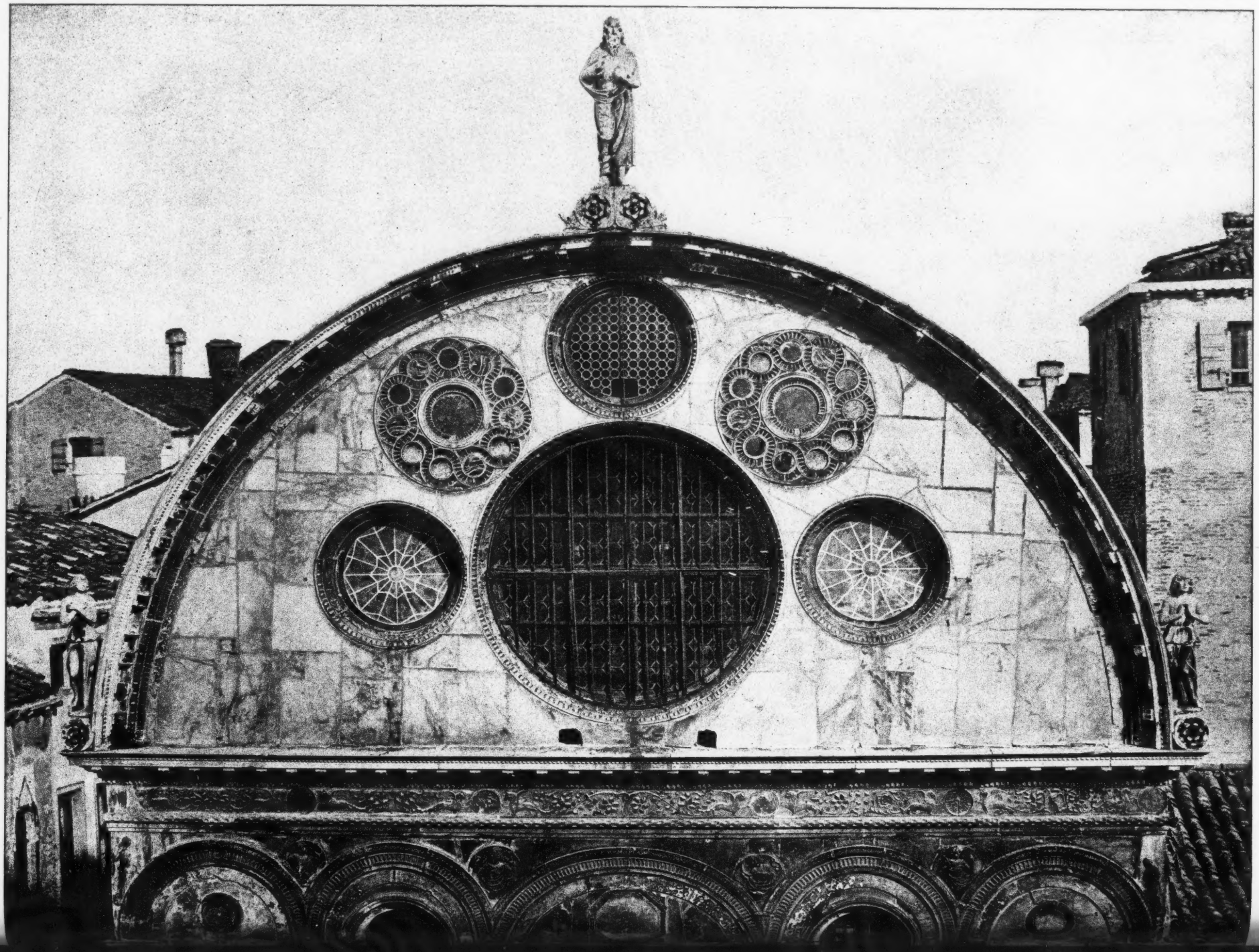

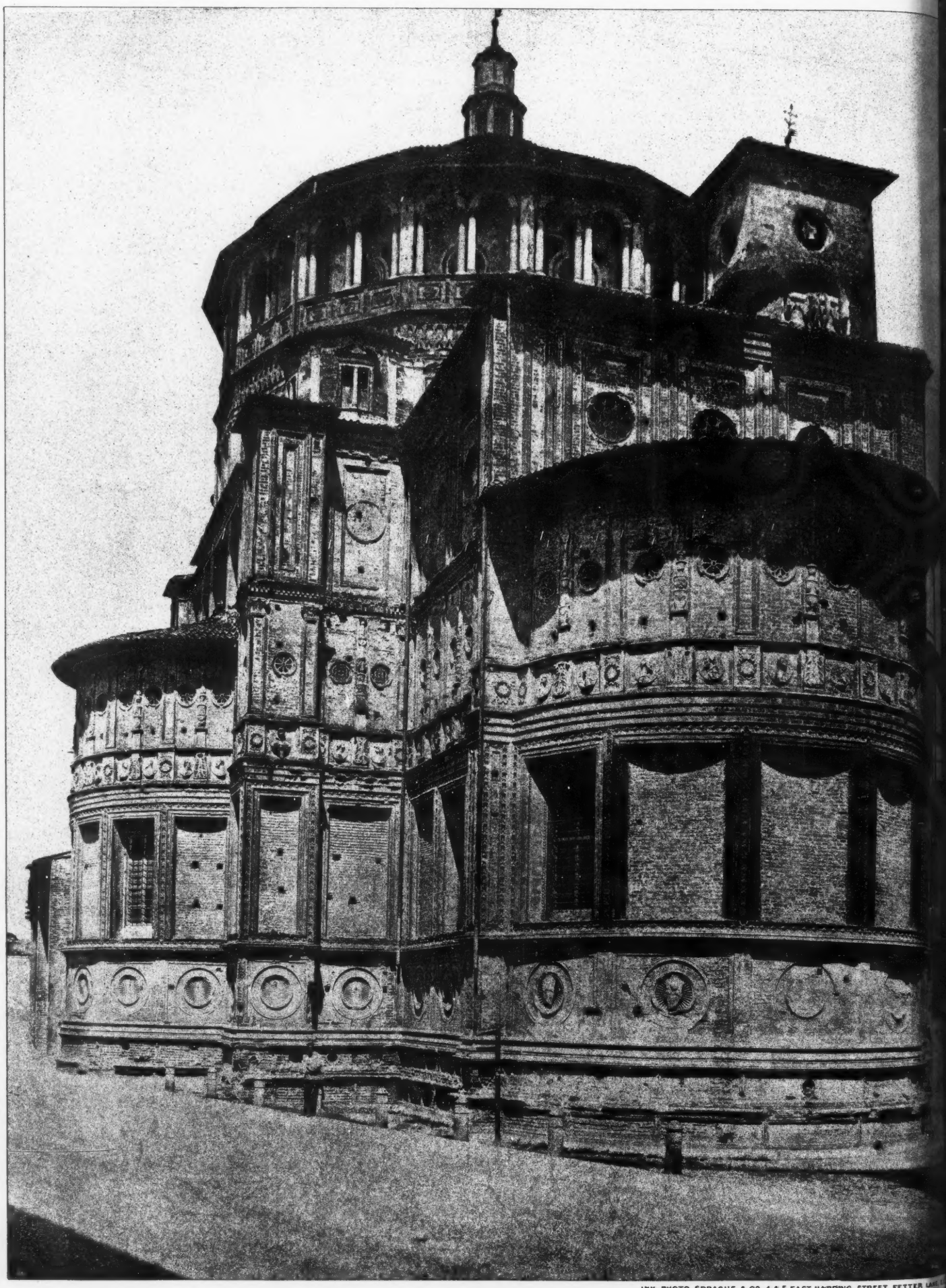

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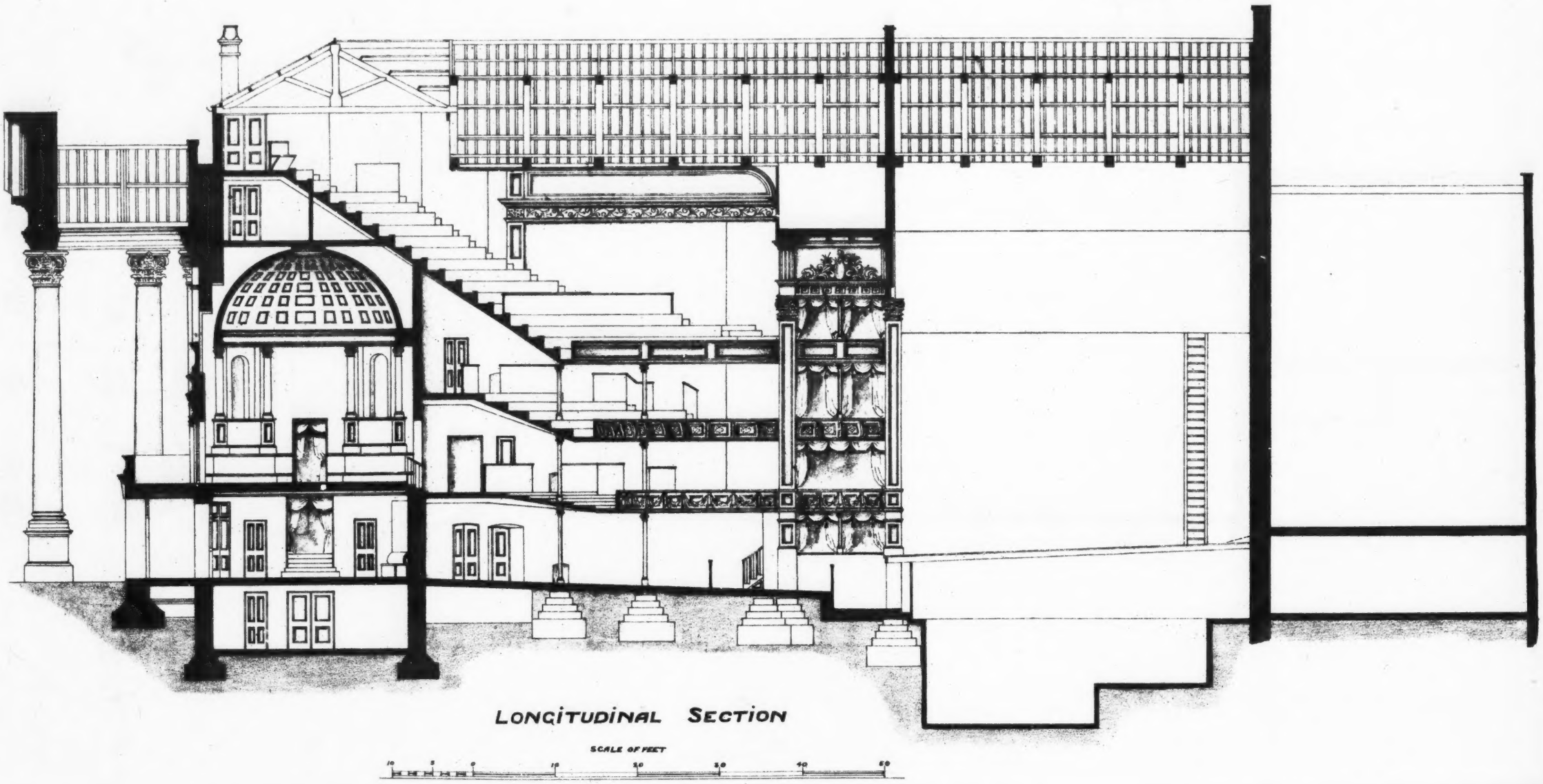

LONGITUDINAL SECTION

SCALE OF FEET

10 5 0 10 20 30 40 60

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SCALE OF FEET
0 5 0 10 20 30 40 50

ENTRANCE TO PIT
DOWN
UP
GENTLEMENS
LAVATORY
PAY
UPPER CIRCLE ENTRANCE & GALLERY EXTRA EXIT
UP
DOWN
UP DRESS CIRCLE
DOWN TO PIT SALOON
ENTRANCE TO
STALLS
DRESS CIRCLE
VESTIBULE
ENTRANCE
HALL
DRESS CIRCLE
BOX OFFICE
LADIES LAVATORY
PIT
STALLS
ORCHESTRA
UP
BOX
BOX
STAGE
SCENE DOCK
UP
BOX
BOX
UP
UP
UP
LIFT
UP
UP
PROPERTY ROOM
DOWN
DOWN
UP
ROOM
VESTIBULE
DRESSING ROOM
DRESSING ROOM
PIT
GENTLEMEN
PIT EXTRA EXIT
LADIES
UP
DOWN
UP
SCENERY ENTRANCE
STAGE DOOR
GALLERY ENTRANCE AND UPPER CIRCLE EXTRA EXIT

PLAN AT PIT AND STALLS LEVEL

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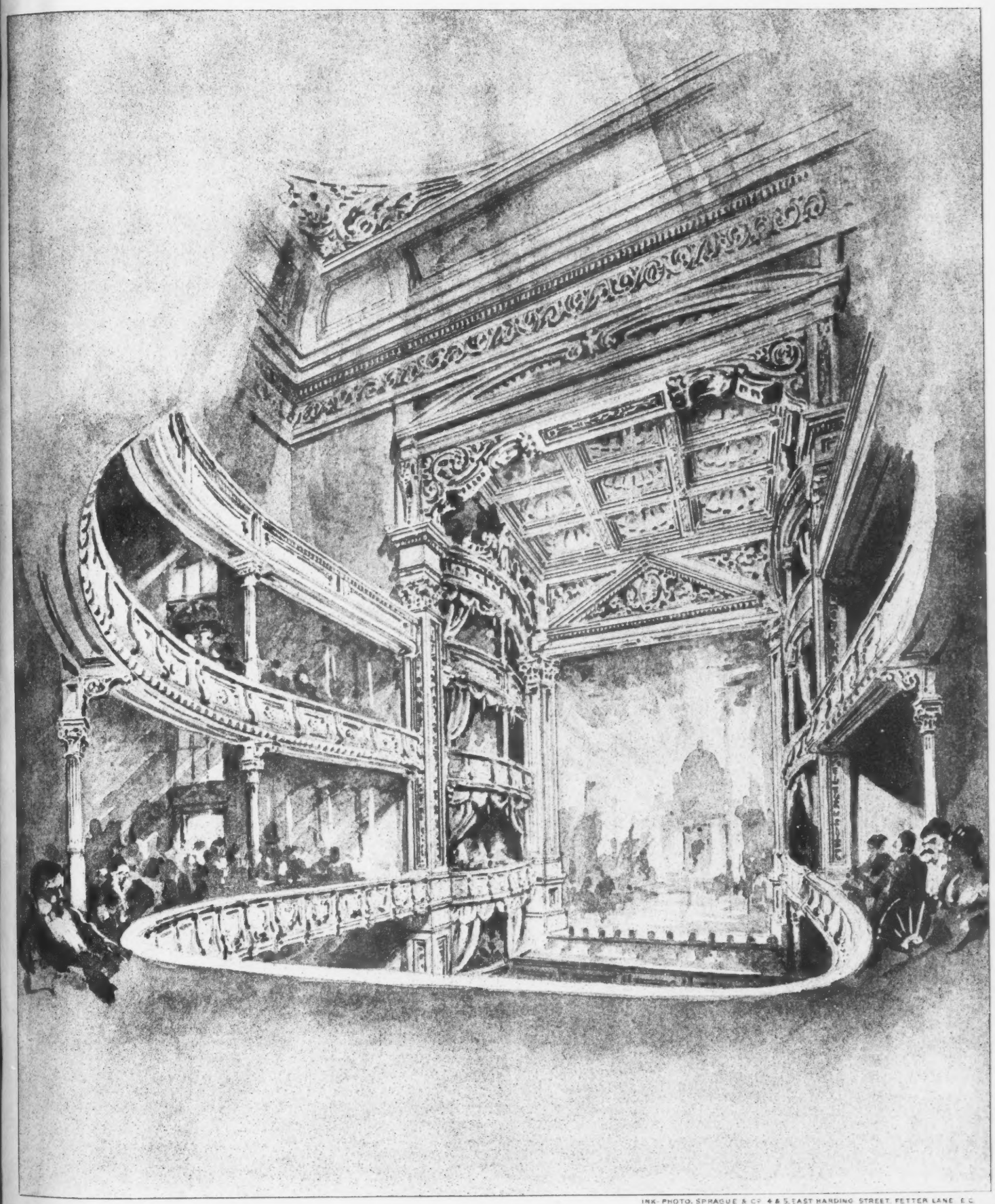

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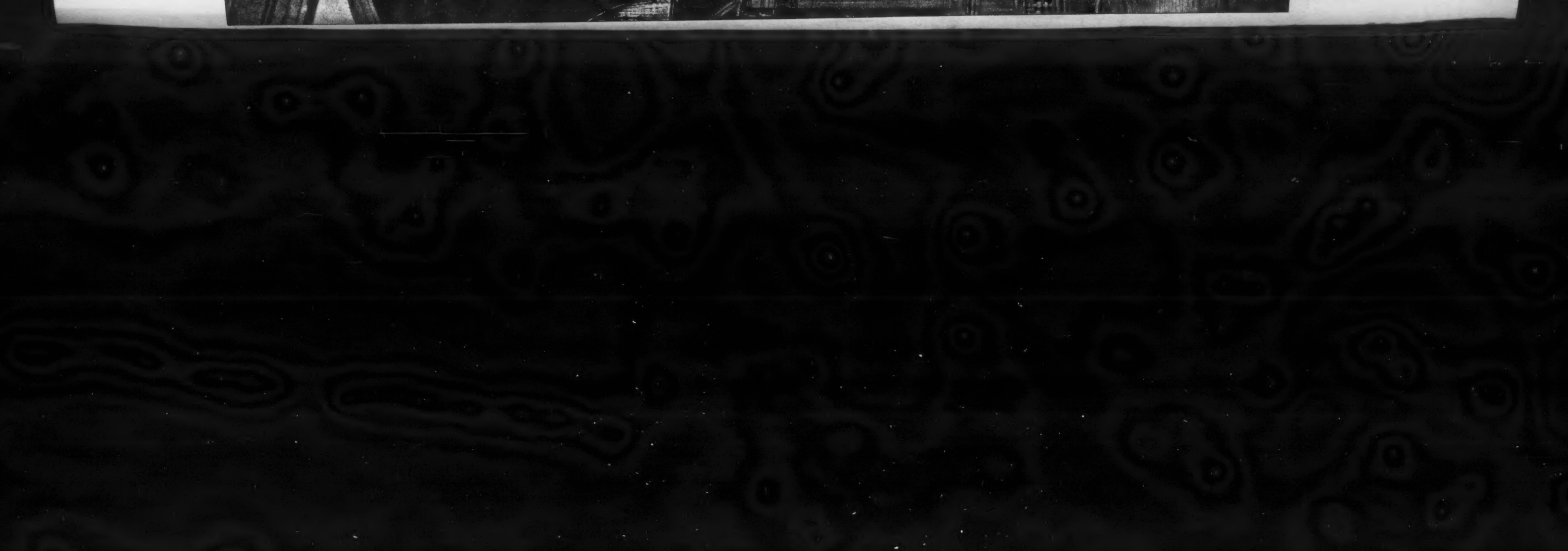

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